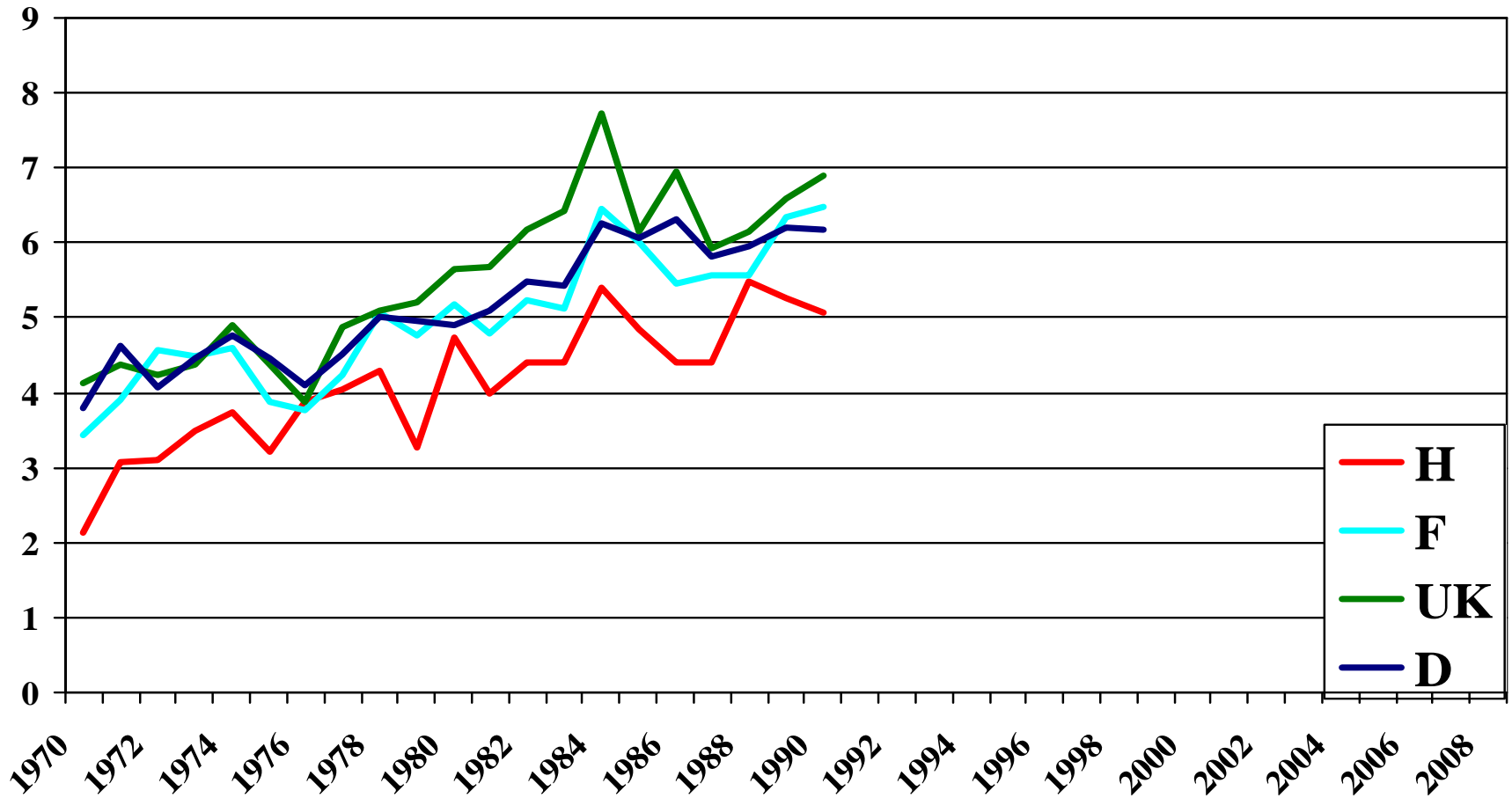




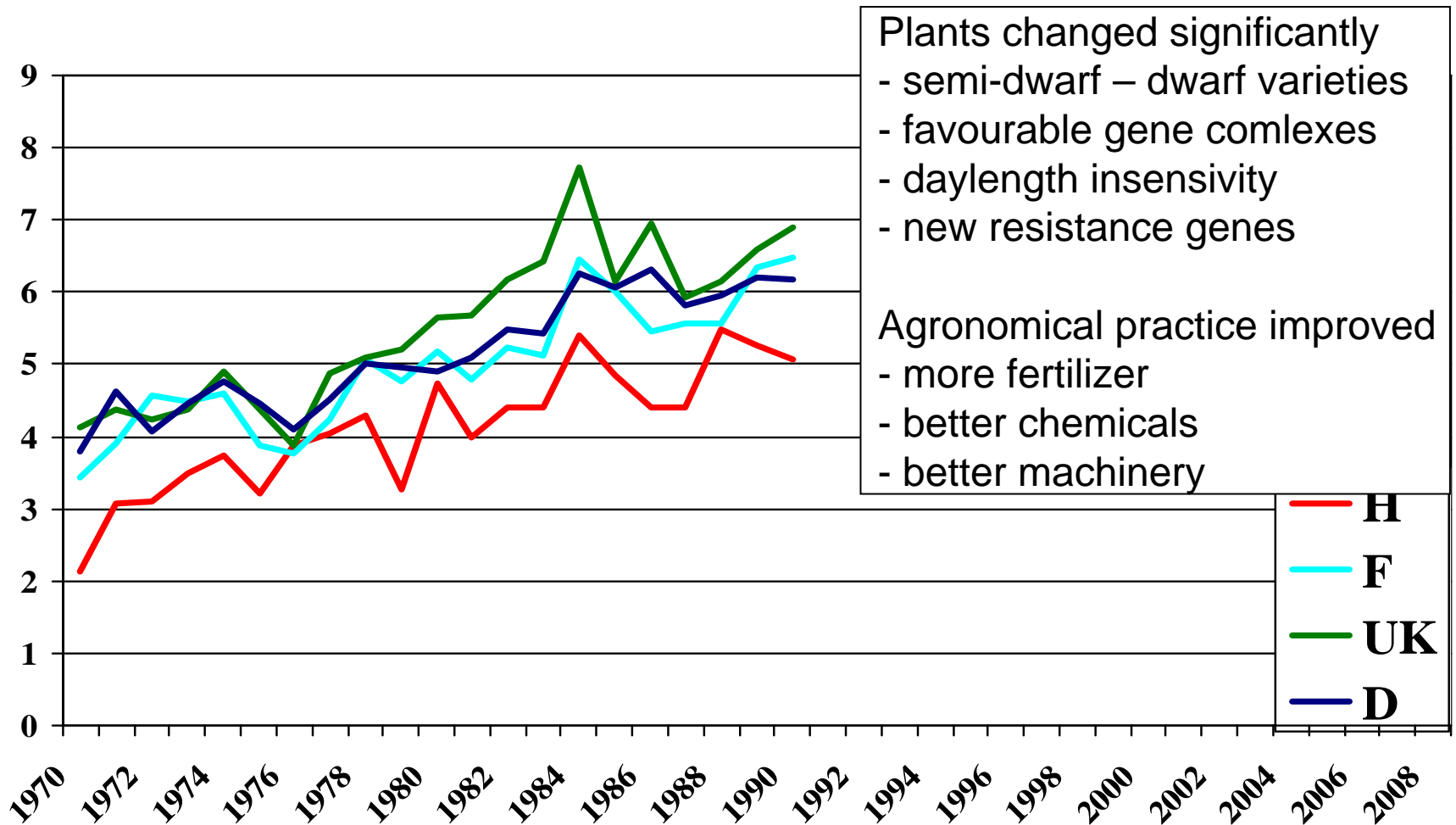
How to satisfy ecological and user demands simultaneously by wheat breeding

László Láng
*Agricultural Research Institute
of the Hungarian
Academy of Sciences*

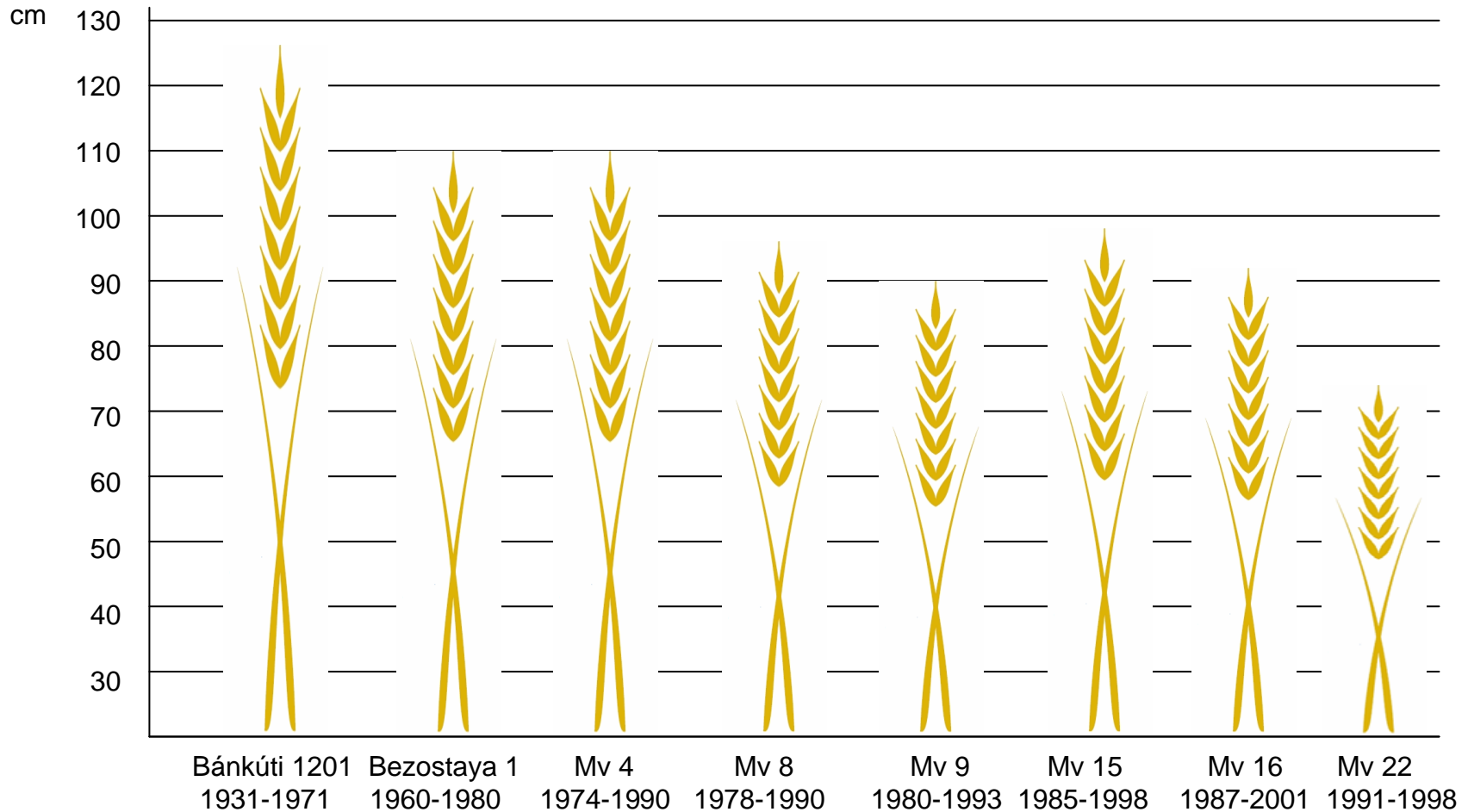
Yield average of majore European wheat producing countries



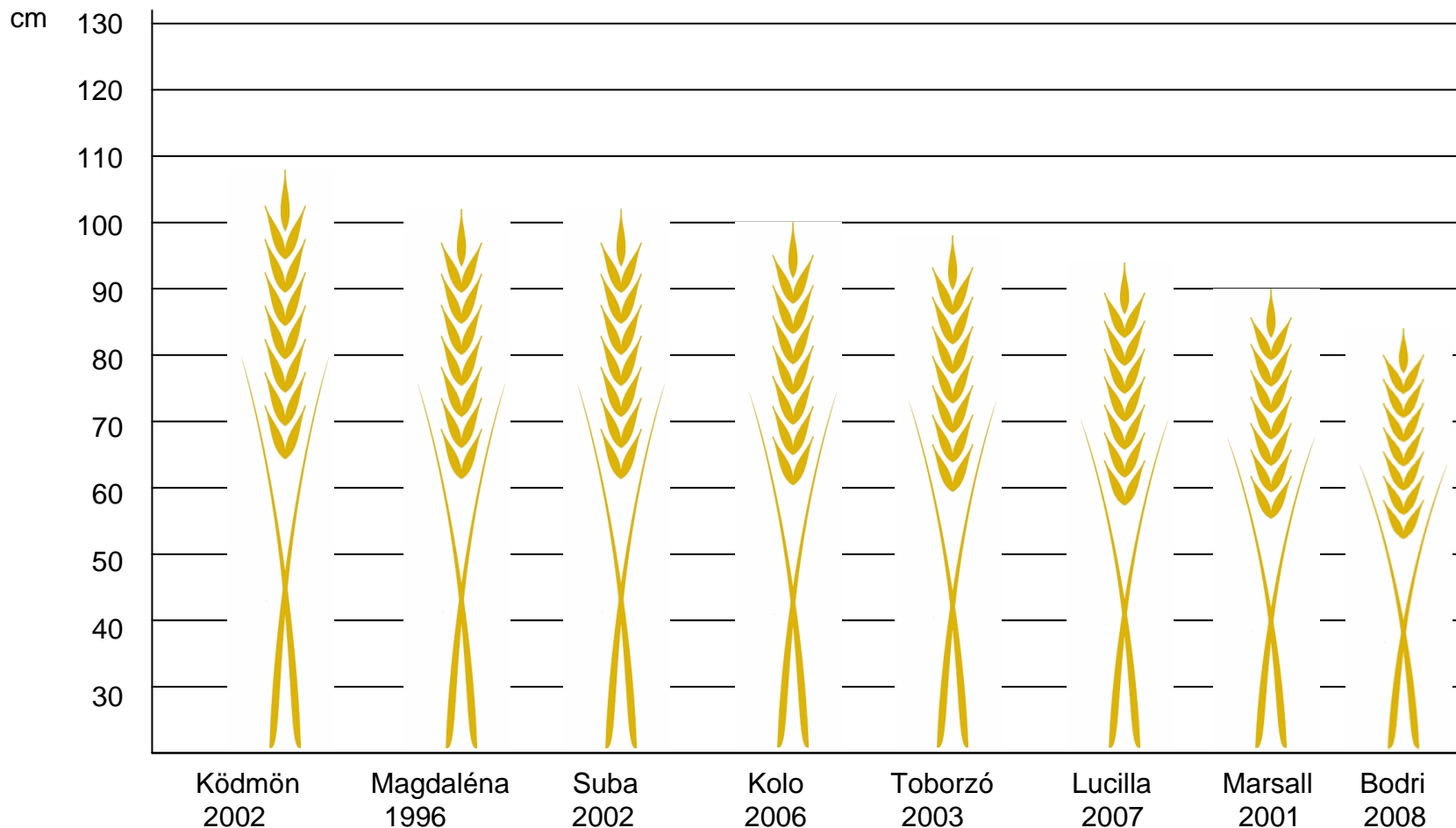
Yield average of major European wheat producing countries



Changes in wheat plant height in Hungary



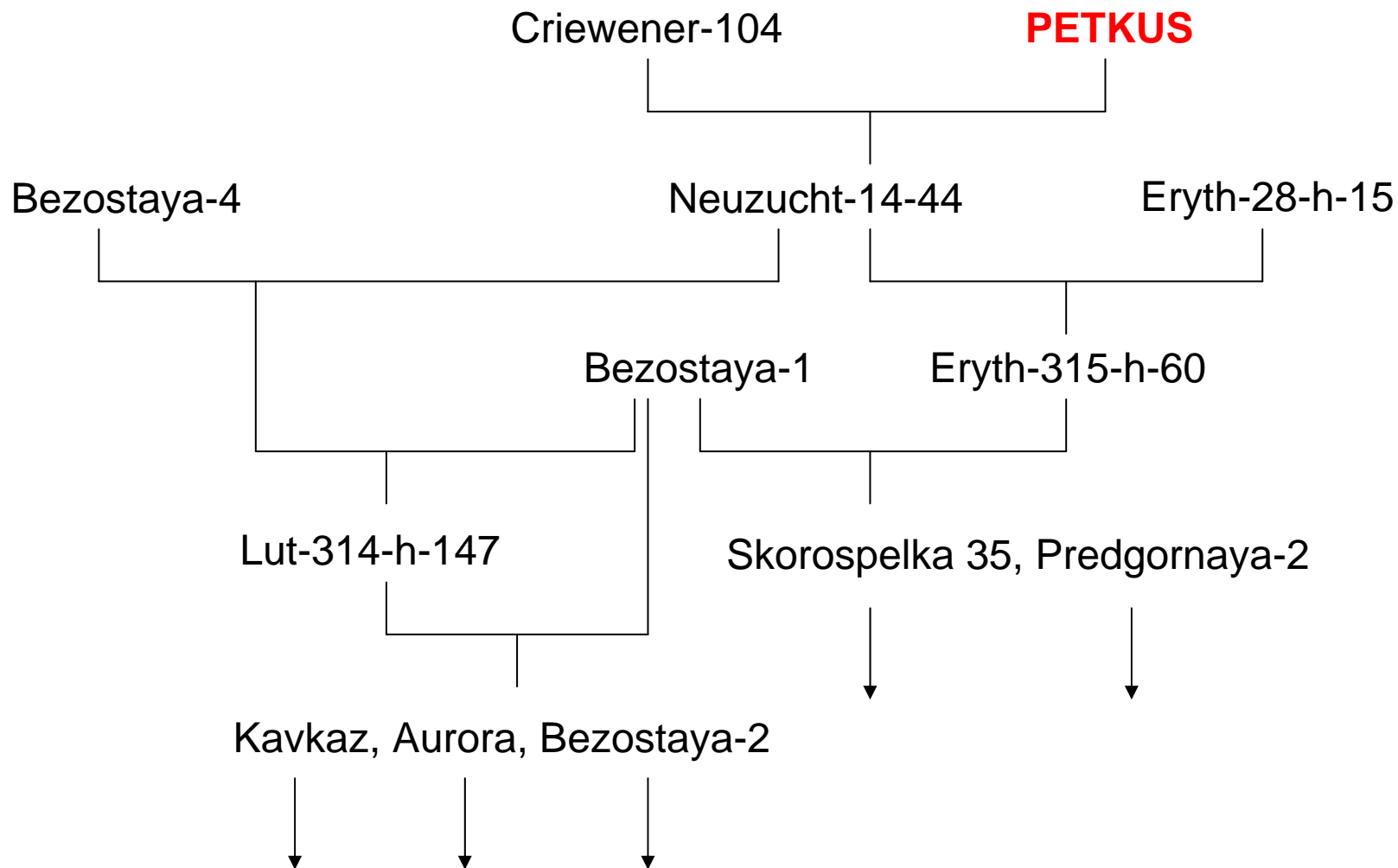
Plant height of the present Mv wheat varieties



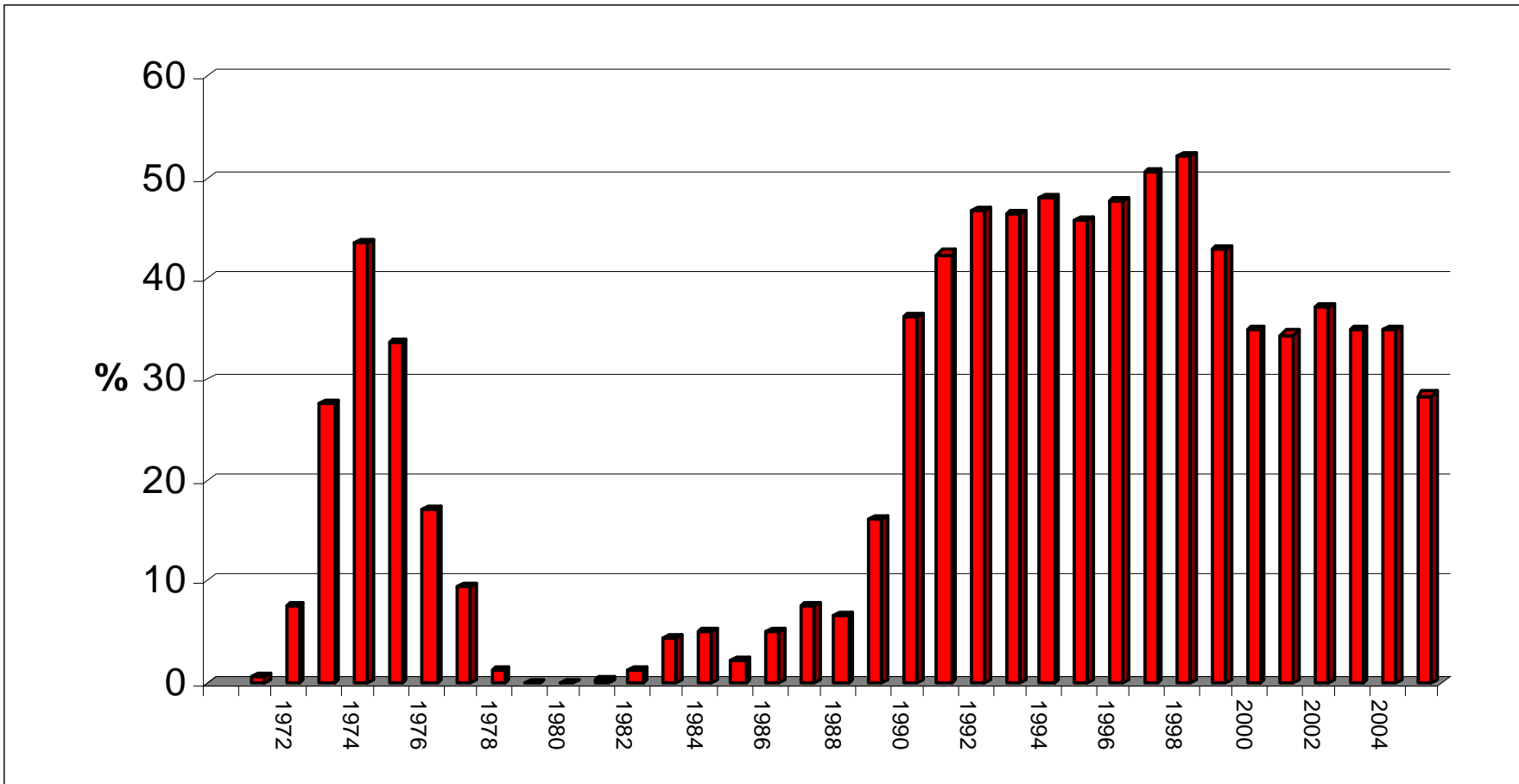
Introduction of *Rht* genes into the Martonvásár breeding programme

- *Rht8* introduced through Bezostaya 1
- *Rht1* in 59 varieties (out of 81)
- *Rht2* in 6 varieties (out of 81)
all varieties registered after 1994 carry
- No *Rht* genes in the first varieties (up to 1974)
Rht1 (96%) or *Rht2* (6%)

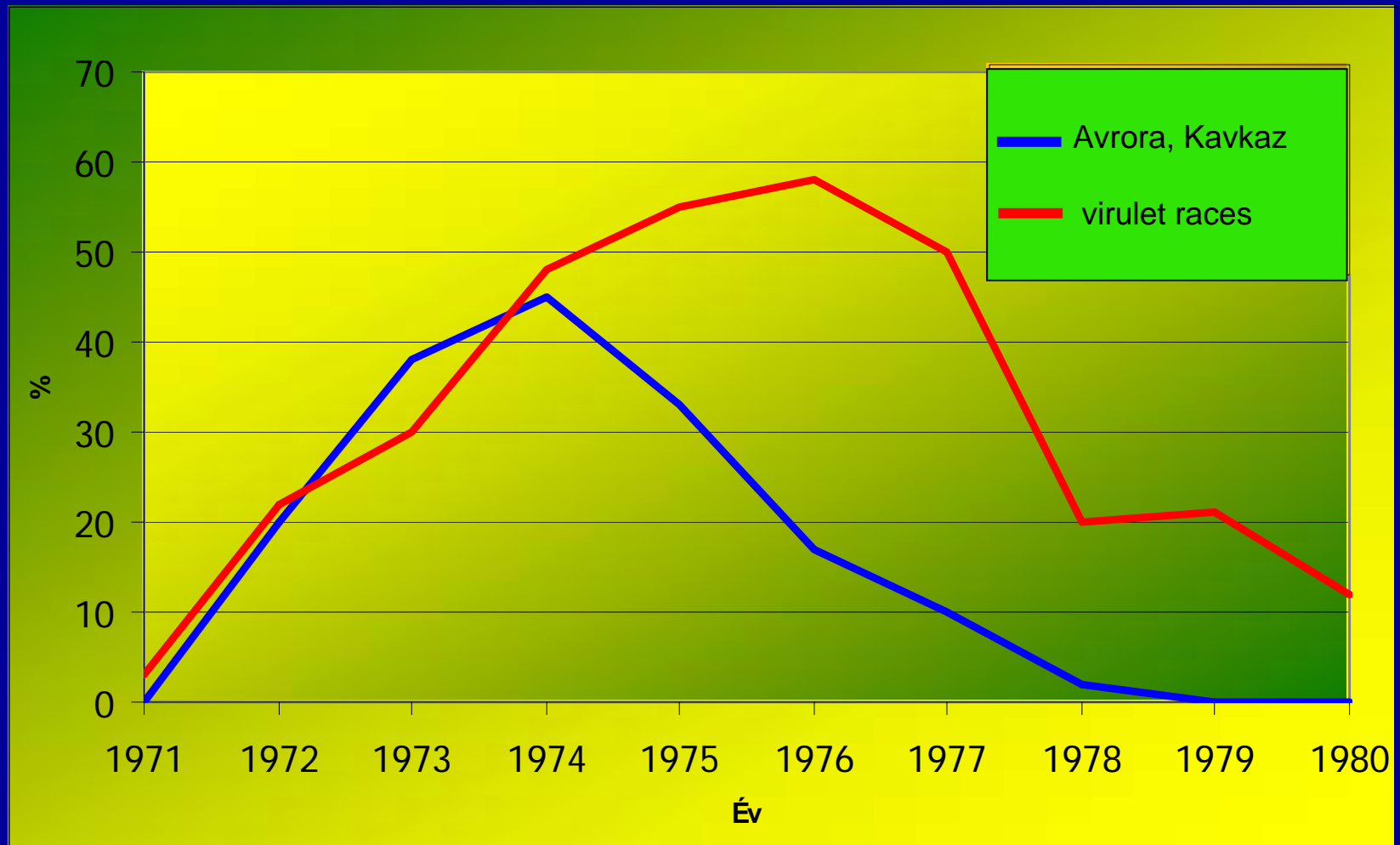
Introduction of the 1B/1R translocation into the Hungarian gene pool



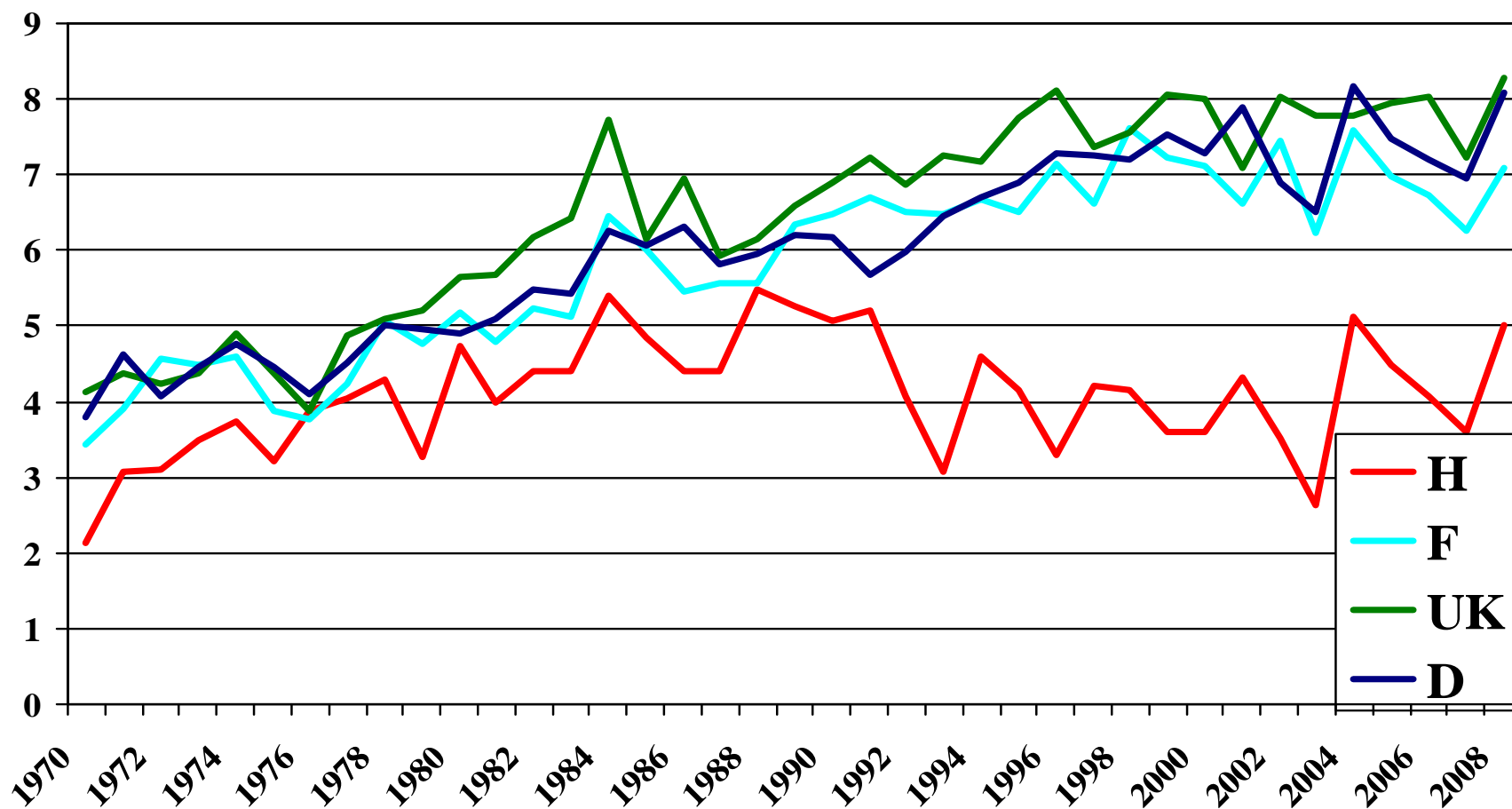
Spread of wheats carrying 1B/1R translocation in the Hungarian wheat production 1971-2005




The spread of *Pm8* and the change of the mildew race composition in Hungary



Yield average of majore European wheat producing countries



A topographic map of Hungary, showing the country's terrain with various shades of green, yellow, and brown representing different elevations. The map is overlaid with a grid of latitude and longitude lines. The text is centered on the map.

**With the increase of the limiting factors
adaptability becomes more
Important than potential yield**

Priorities in the Hungarian wheat breeding

Quality

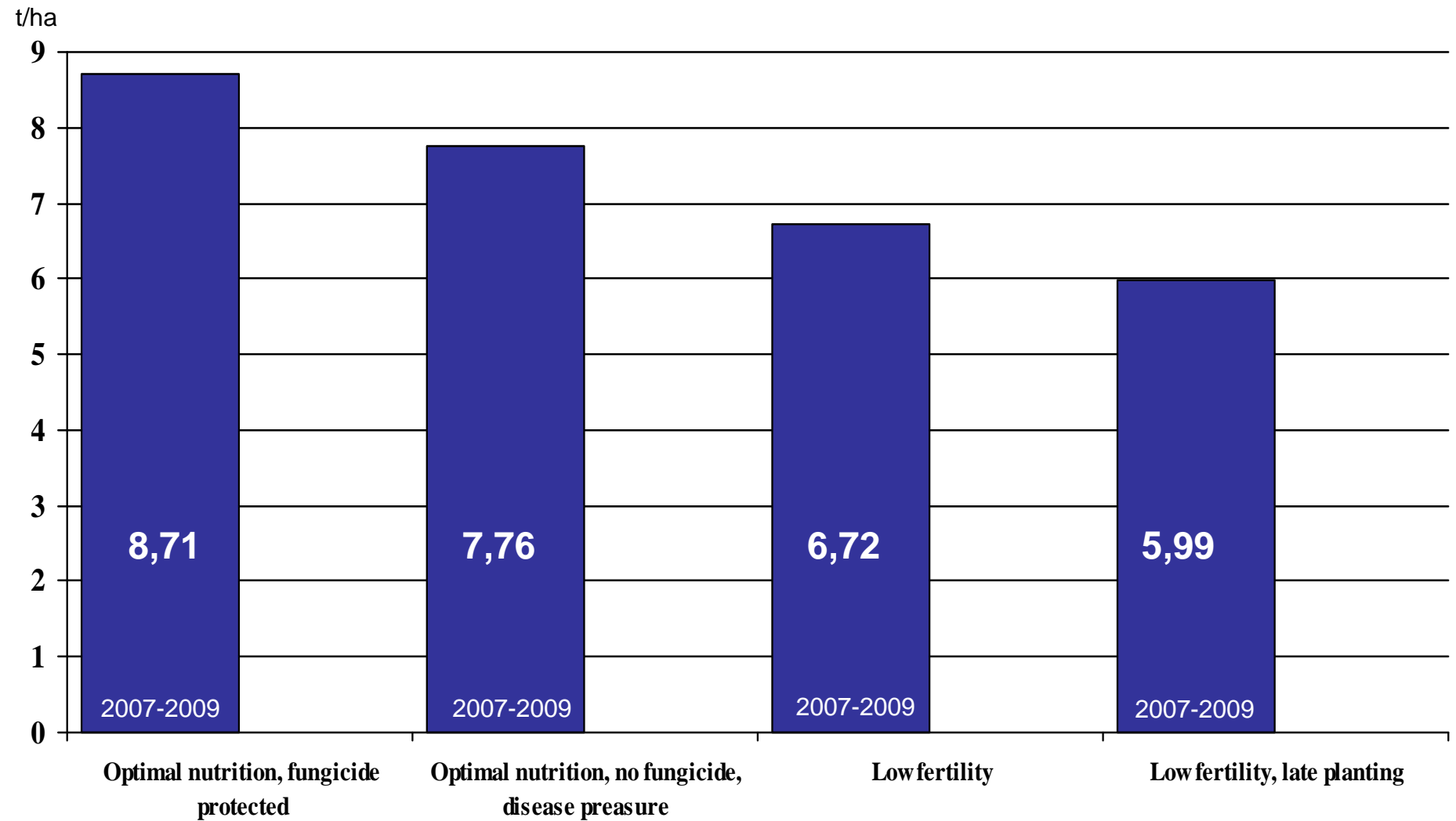
Quality stability – also under low input conditions

Yield stability –
drought tolerance
heat tolerance
disease resistance
winter hardiness

Yielding ability

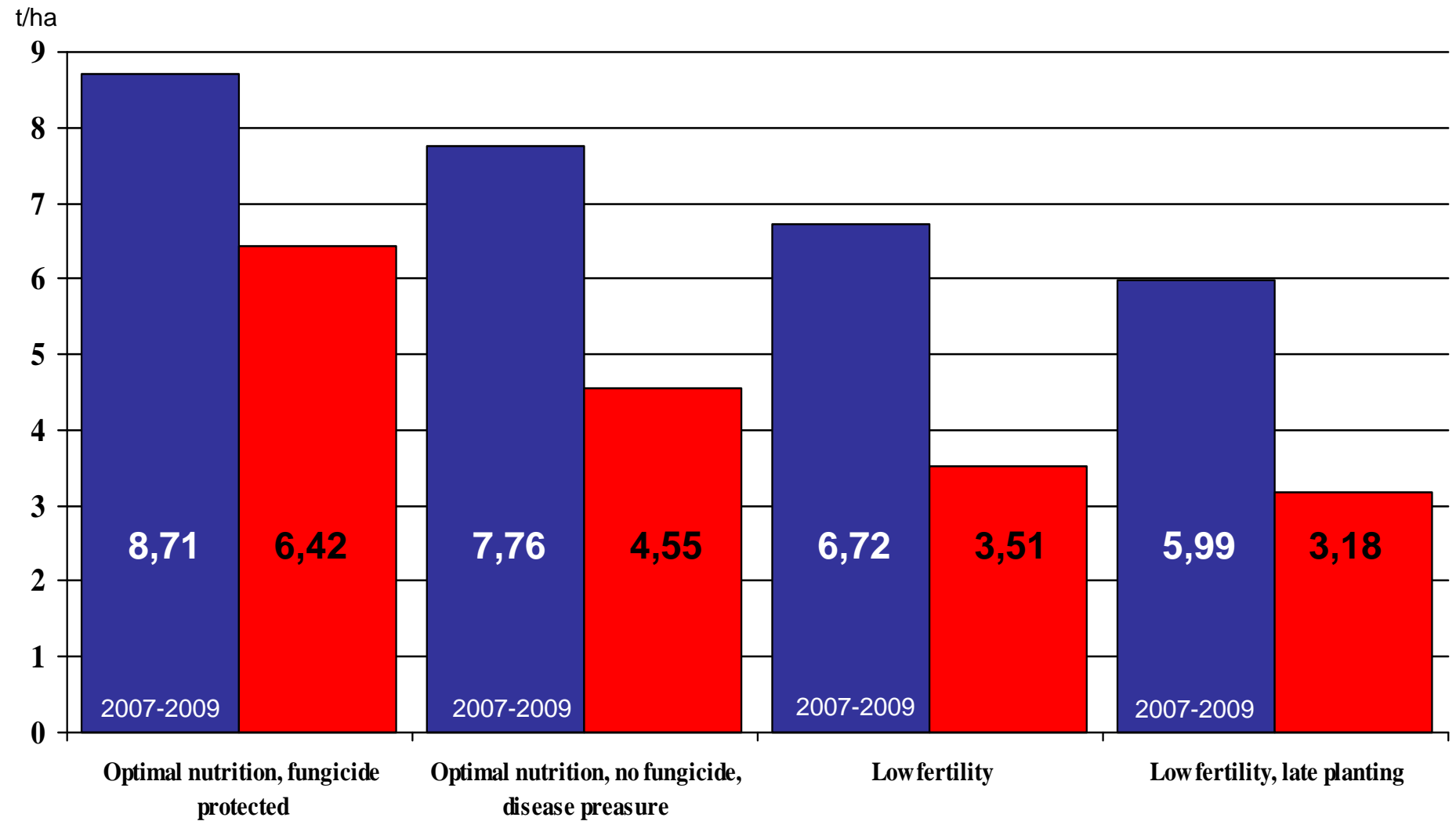
Effect of agronomical practice and year on the yield of wheats

Martonvásár, 2010, average of 198 genotypes



Effect of agronomical practice and year on the yield of wheats

Martonvásár, 2010, average of 198 genotypes

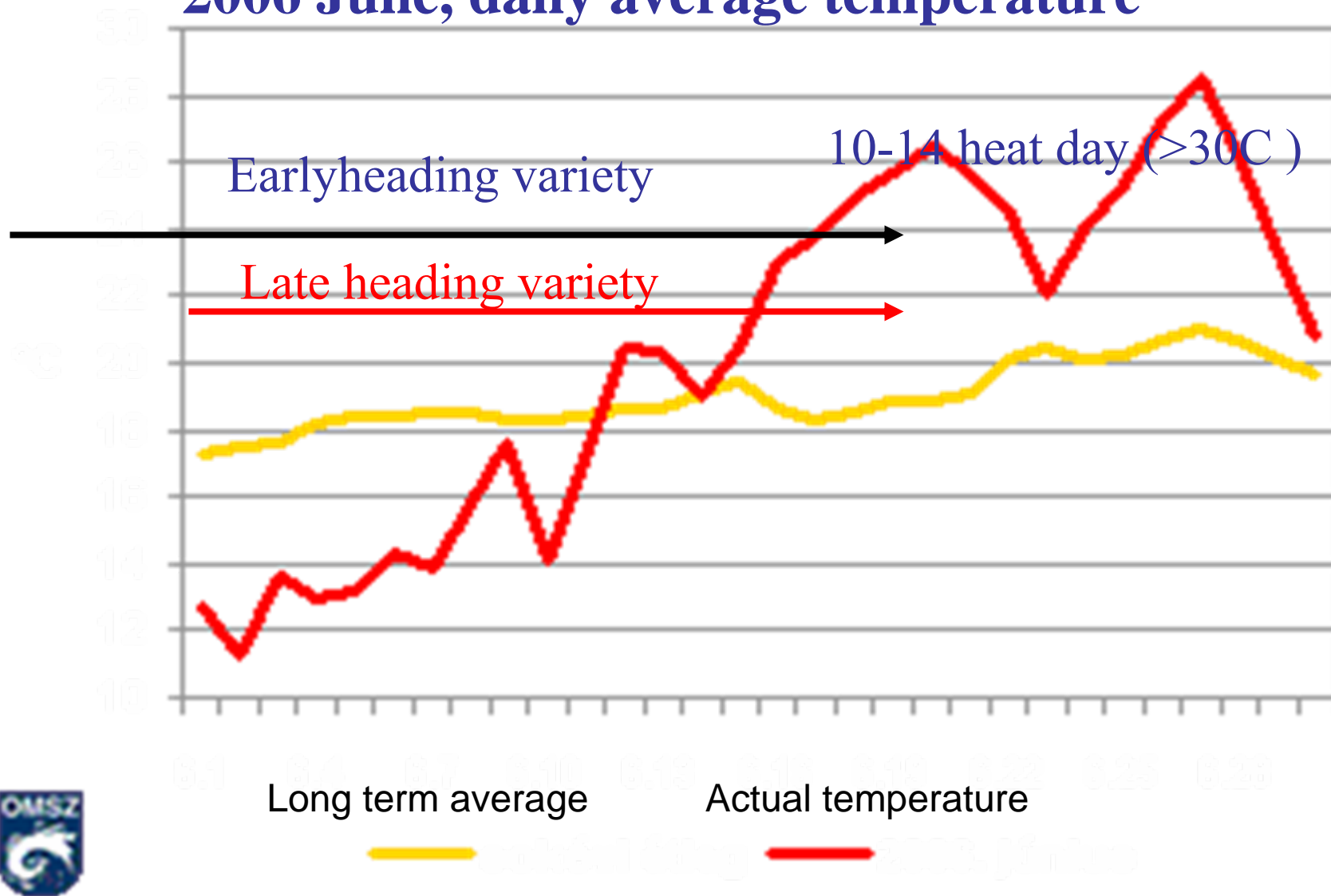


Factors of wheat adaptability

- Winter hardiness (frost tolerance)



2006 June, daily average temperature



Long term average

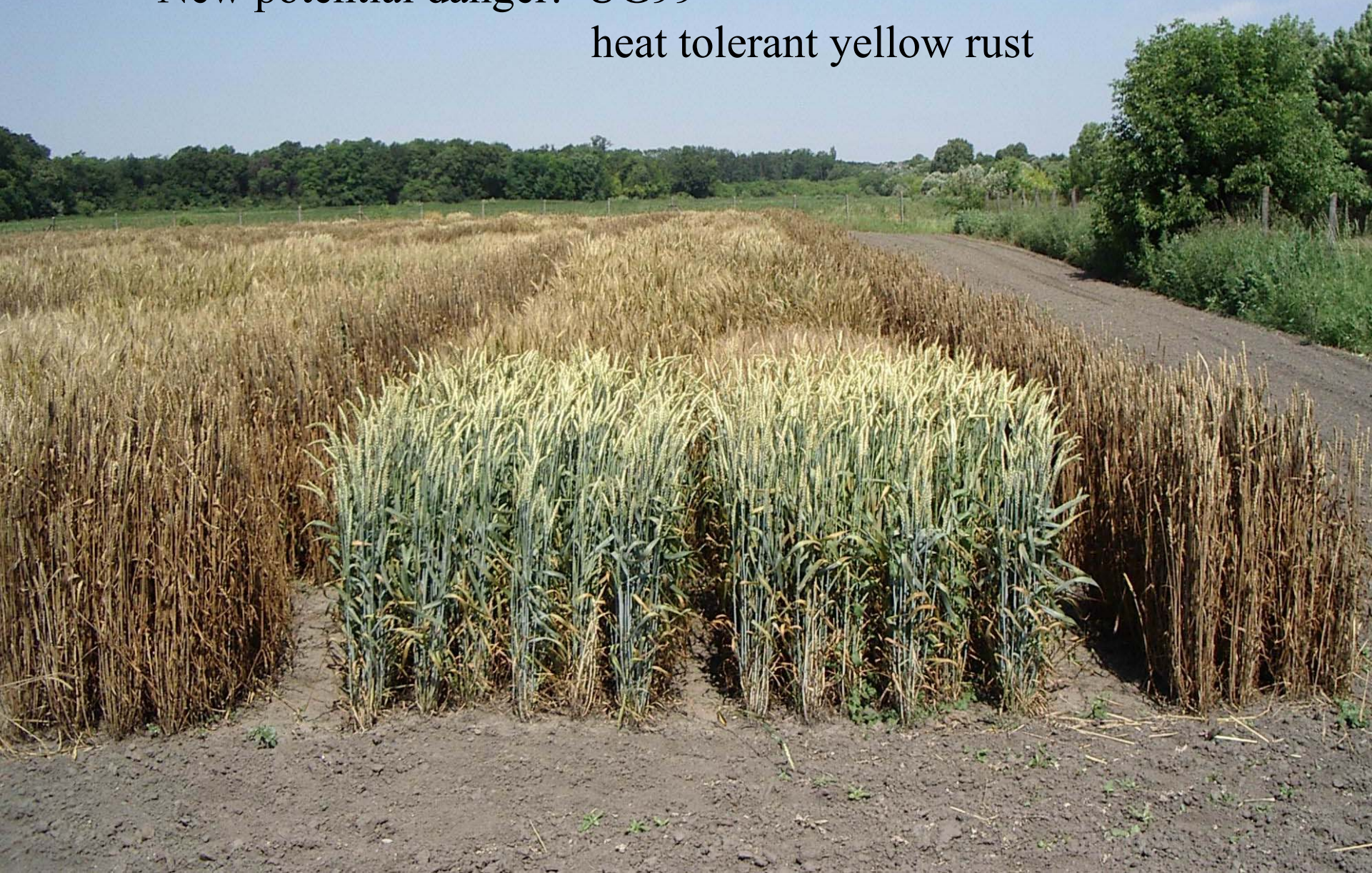
Actual temperature

Epidemics in the Hungarian wheat production

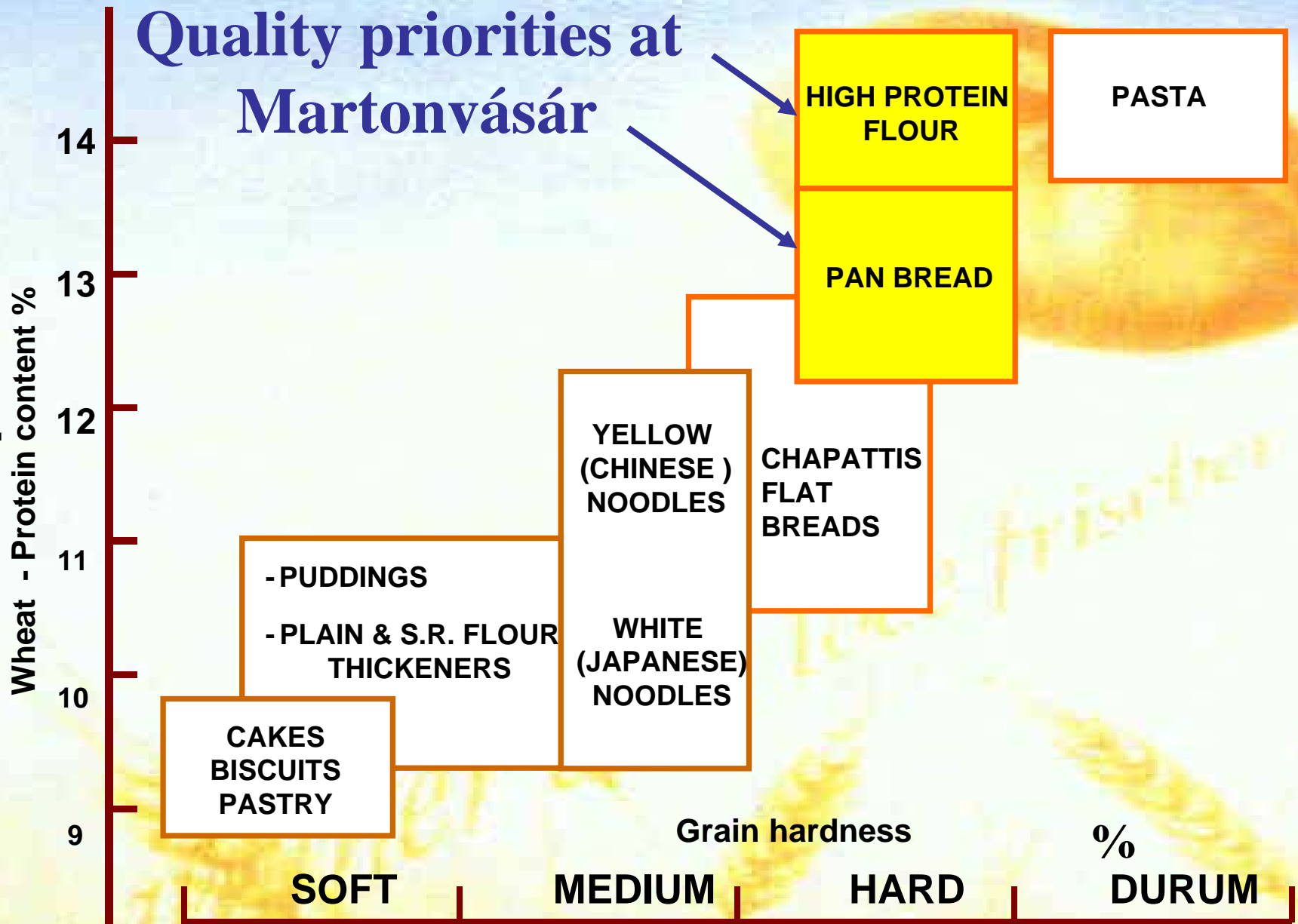
(After Szunics et al., Apponyiné et al., and Csőszné et al.)

Disease	Epidemics
Stem rust	1873, 1926, 1932, 1933, 1936, 1952, 1954, 1972
Leaf rust	1952, 1957, 1958, 1975, 1981, 1982, 1988, 1990, 1994, 1995, 1996, 1997, 1998, 1999, 2006, 2010
Yellow rust	1933, 1977, 1985, 1994, 1995, 2000, 2001
Powdery mildew	1961, 1987, 1988, 1989, 1994, 1998
Head blight	1925, 1965, 1970, 1972, 1975, 1978, 1979, 1985, 1991, 1996, 1997, 1998, 1999, 2006, 2010
Snow malt	1996, 1997
Smuts	before 1950
Viruses	1966, 1972, 1976, 1980, 1981, 1982, 1986, 1990, 1996, 1998, 2007
Septoria, Helminthosporium	1999, 2005, 2010

New potential danger: UG99
heat tolerant yellow rust



Quality priorities at Martonvásár





Variety



Environment

(agronomical practice



Year

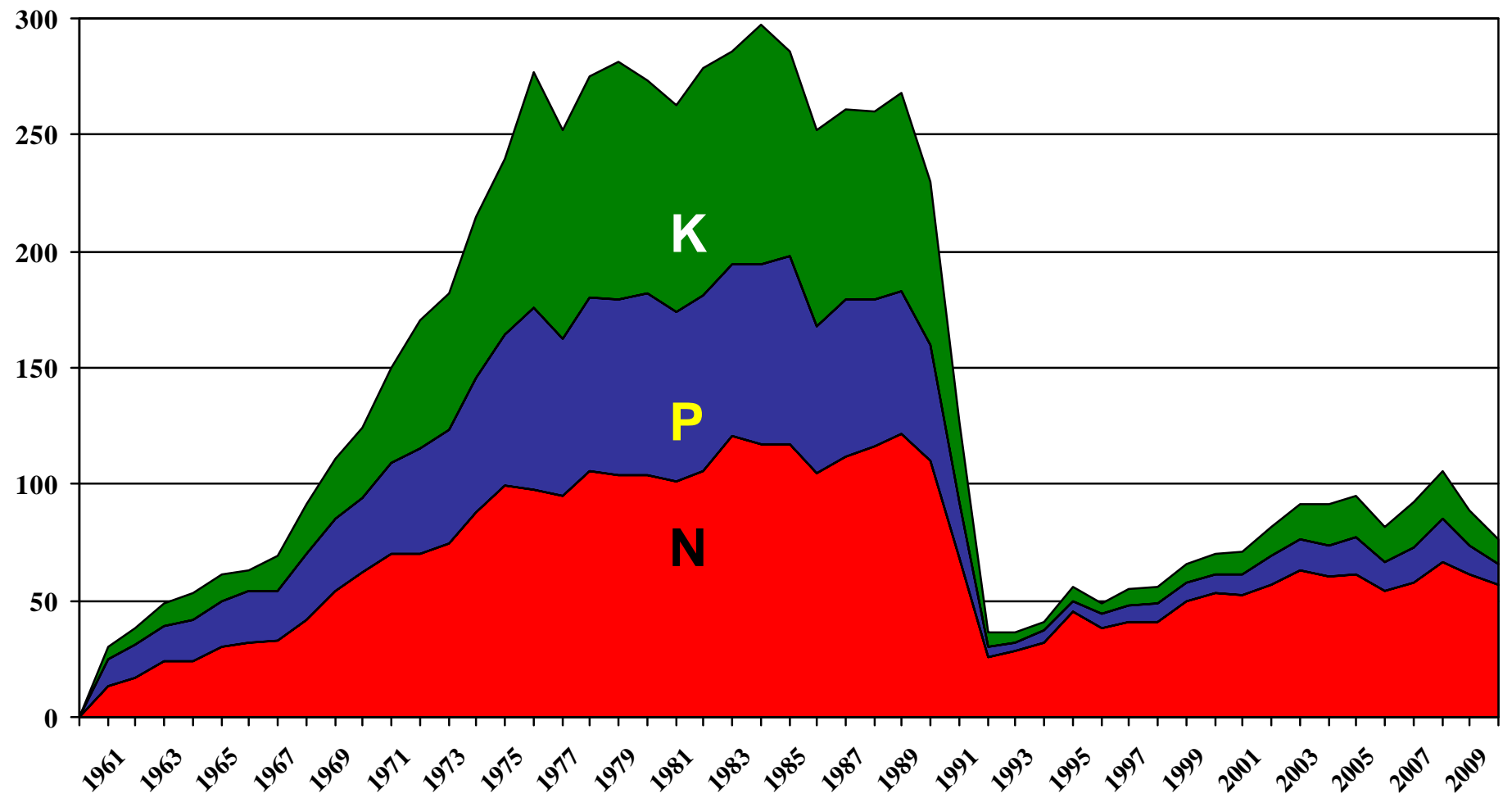


Interactions



Fertiliser use in Hungary

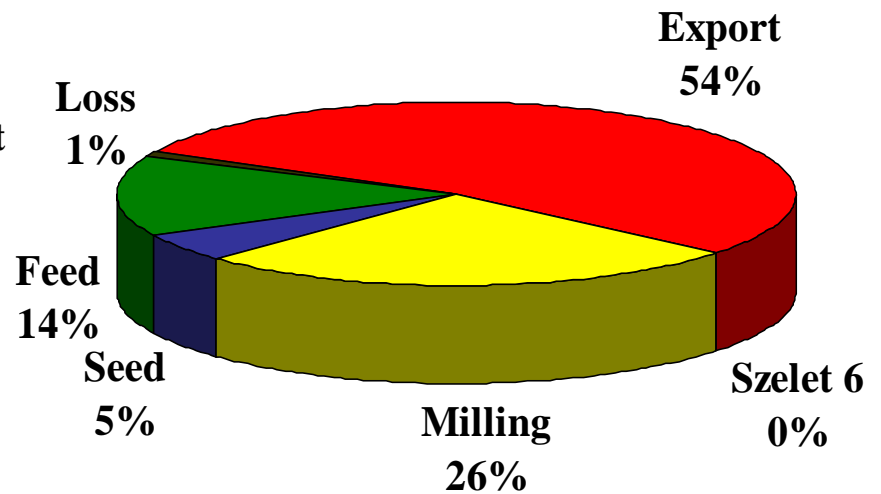
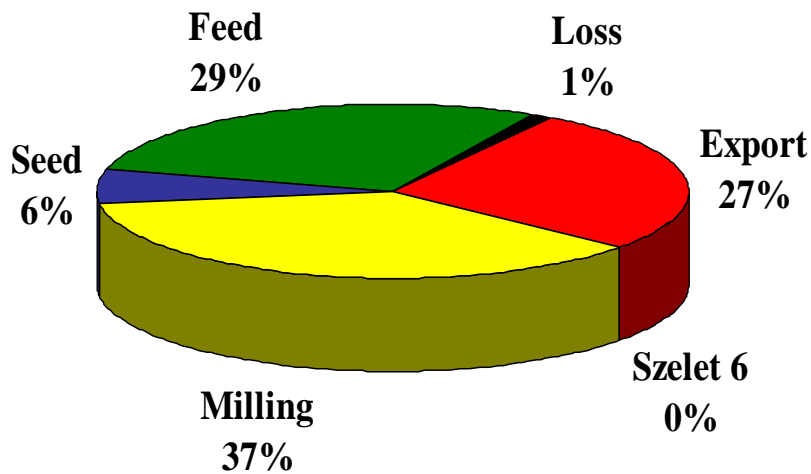
1960-2009, kg/ha



Wheat utilization in Hungary

1997-2000

2005



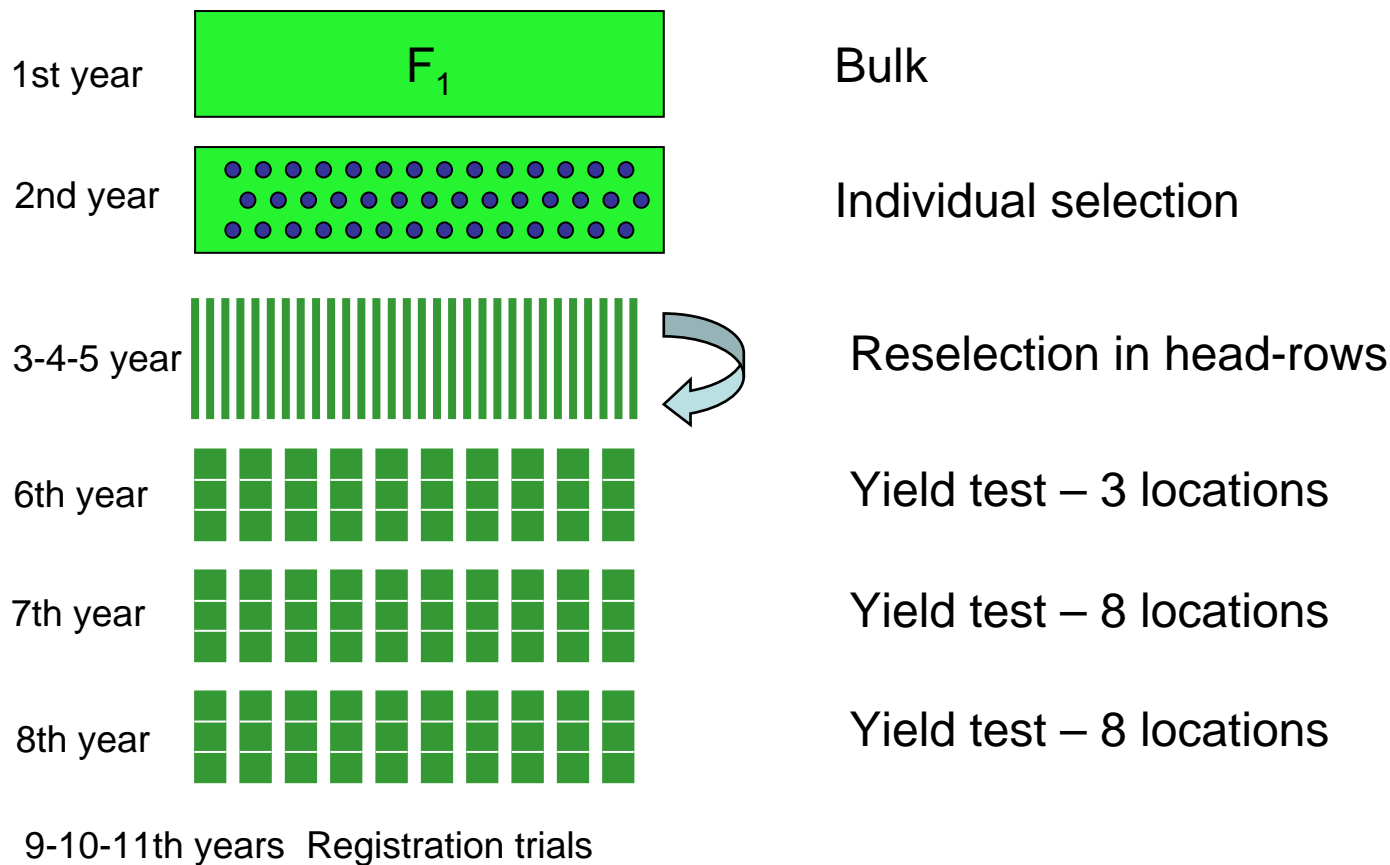
”the most of the important wheat attributes are poligenic, so breeders have to work with large breeding material, because the chance for finding the rare favourable combinations increase with the size of the program and with the effectiveness of the selection methods.”

(Lelley János)

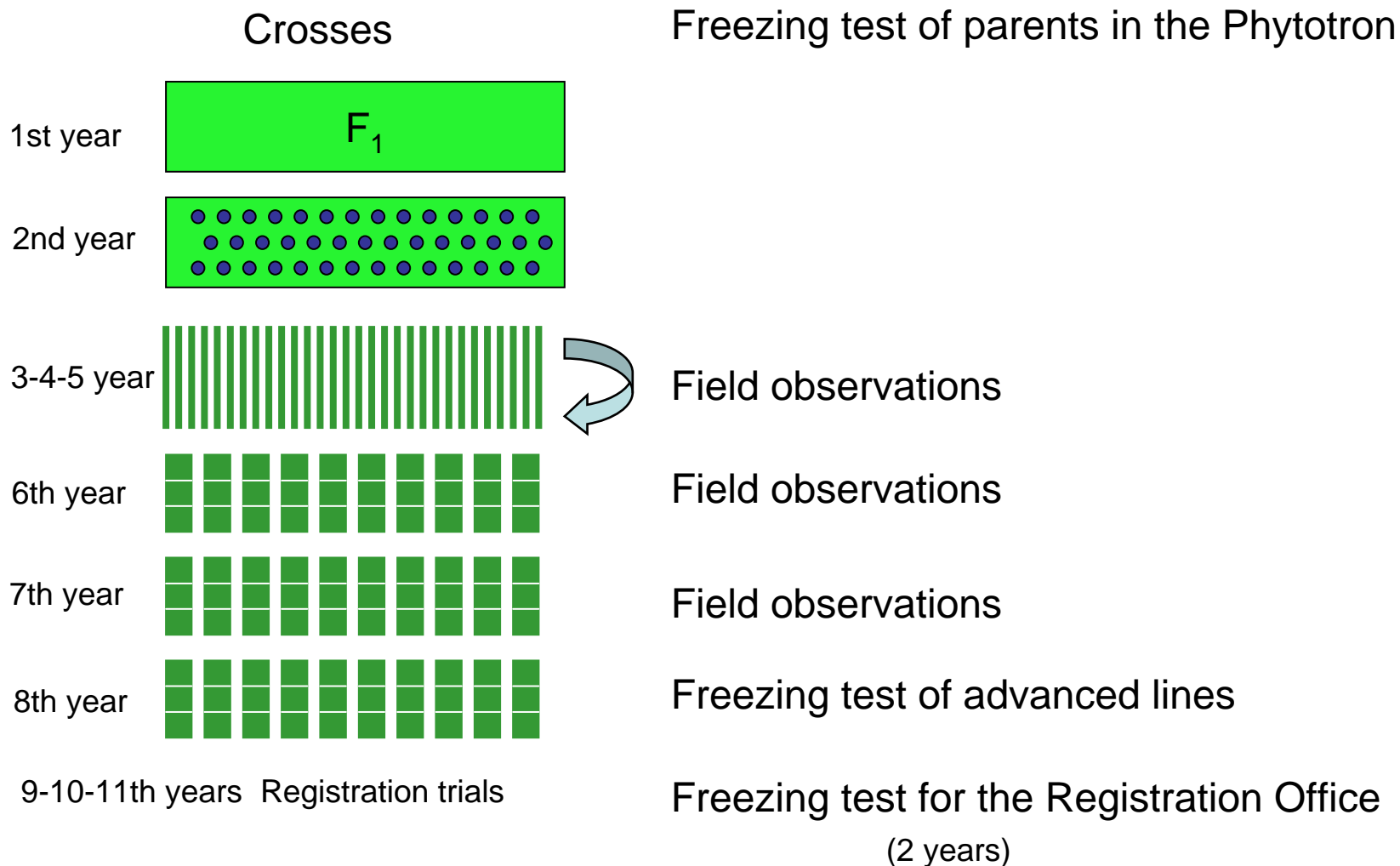


Selection scheme of the Martonvásár wheat breeding programme

Crosses

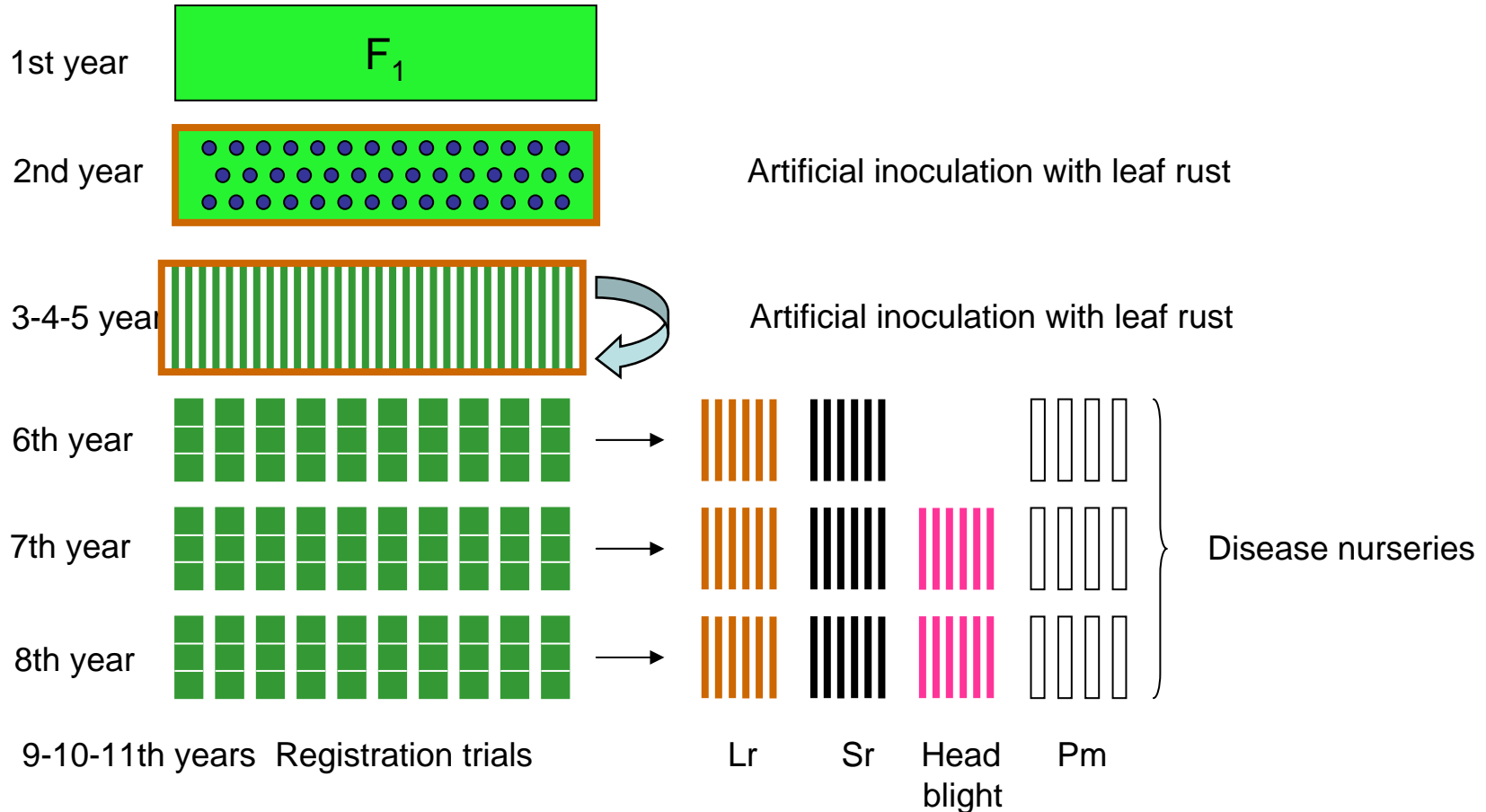


Breeding for adaptability – winter hardiness



Breeding for adaptability – disease resistance

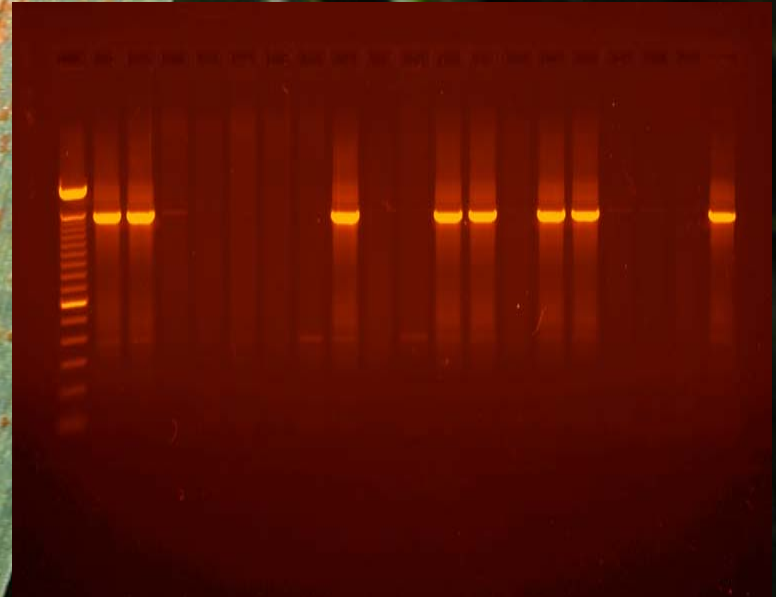
Crosses



Molecular characterisation of the varieties

Mv Béres

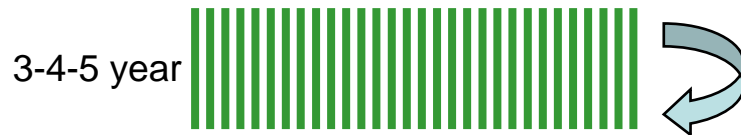
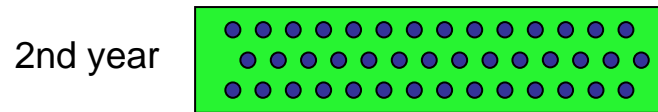
Rht1	1
Rht2	0
VrnA1	1
VrnB1	1
VrnD1	1
Lr1	0
Lr10	1
Lr26	1
Lr34	0
Sr2	1
Sr24	0
Sr26	0
Sr31	1
Sr36	0
Cre1	0
Cre3	0
Yr9	1



Selection for quality

Crosses

Detailed test of parents quality



9-10-11th years Registration trials

F₄ – kernel hardness (SKCS), protein, gluten, Zeleny (NIR/NIT)

F₅ – protein, gluten, Zeleny (NIR/NIT)

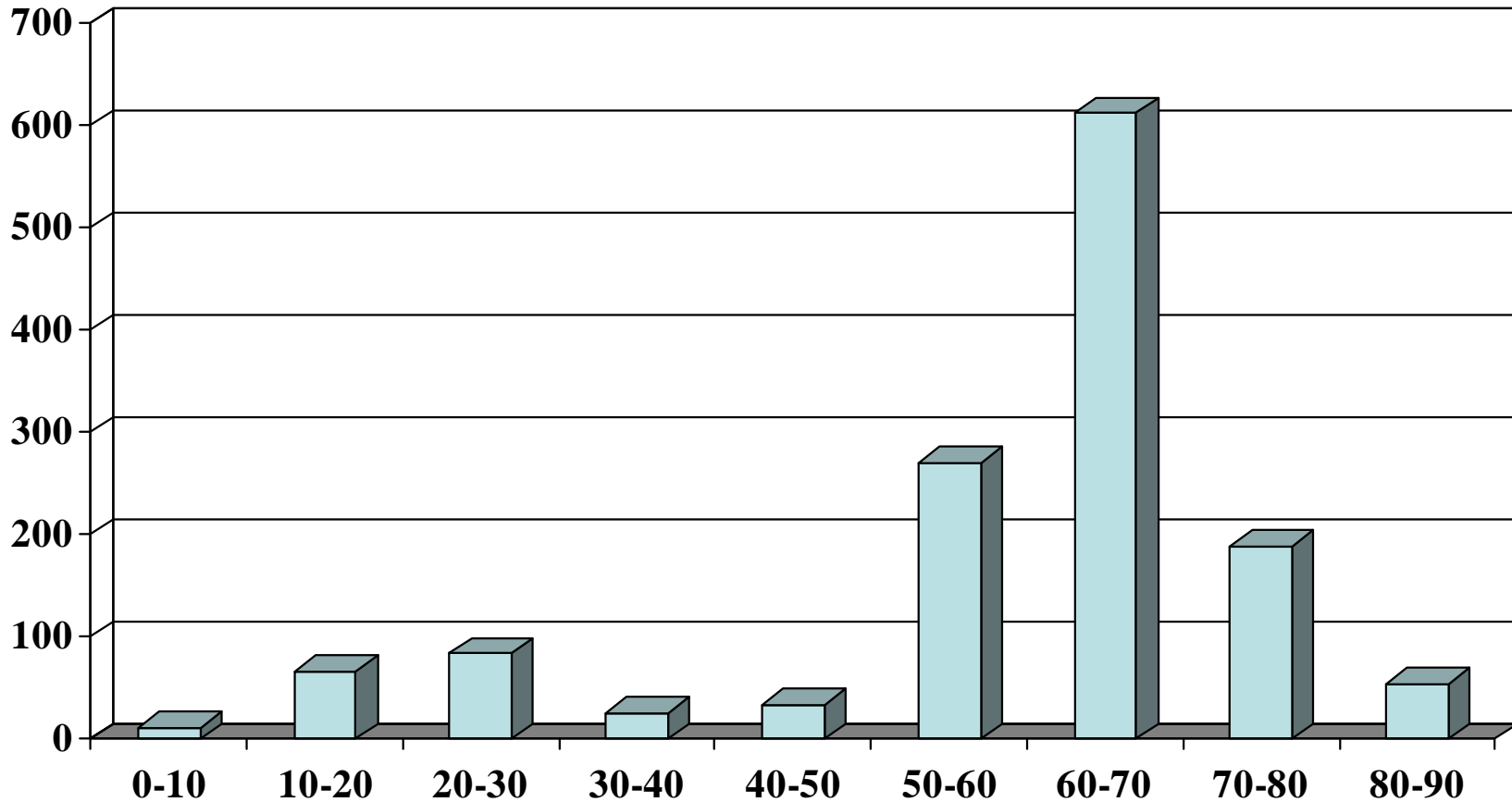
wet gluten, Zeleny, Falling number, Farinograph

protein, gluten, Zeleny (NIR/NIT), wet gluten, Zeleny, Falling number, Farinograph, Alveograph

protein, gluten, Zeleny (NIR/NIT), wet gluten, Zeleny, Falling number, Farinograph, Alveograph, 2 locations

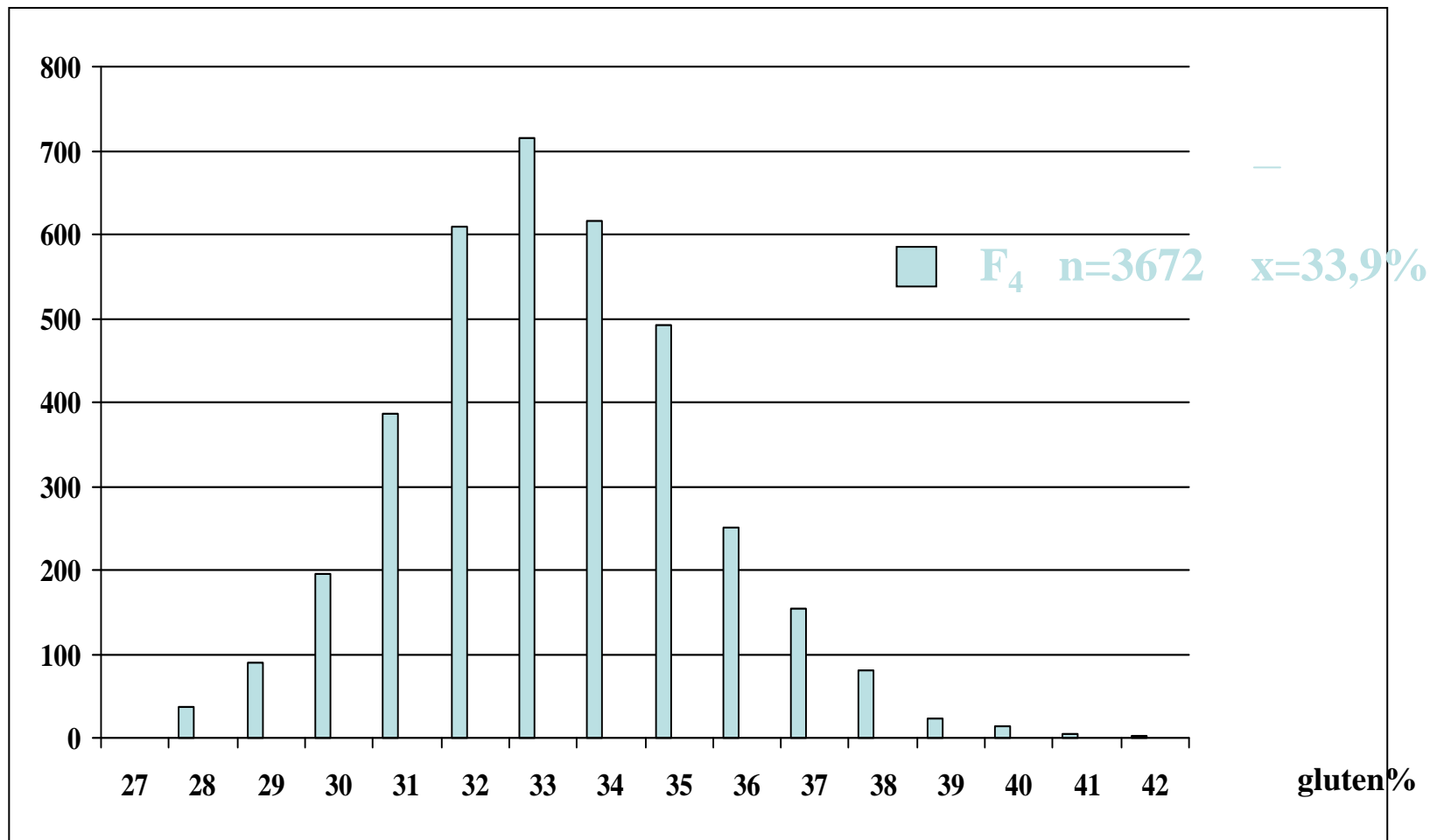
protein, gluten, Zeleny (NIR/NIT), wet gluten, Zeleny, Falling number, Farinograph, Alveograph, 2 locations
Extensograph

Distribution of kernel hardness in the Martonvásár wheat breeding programme



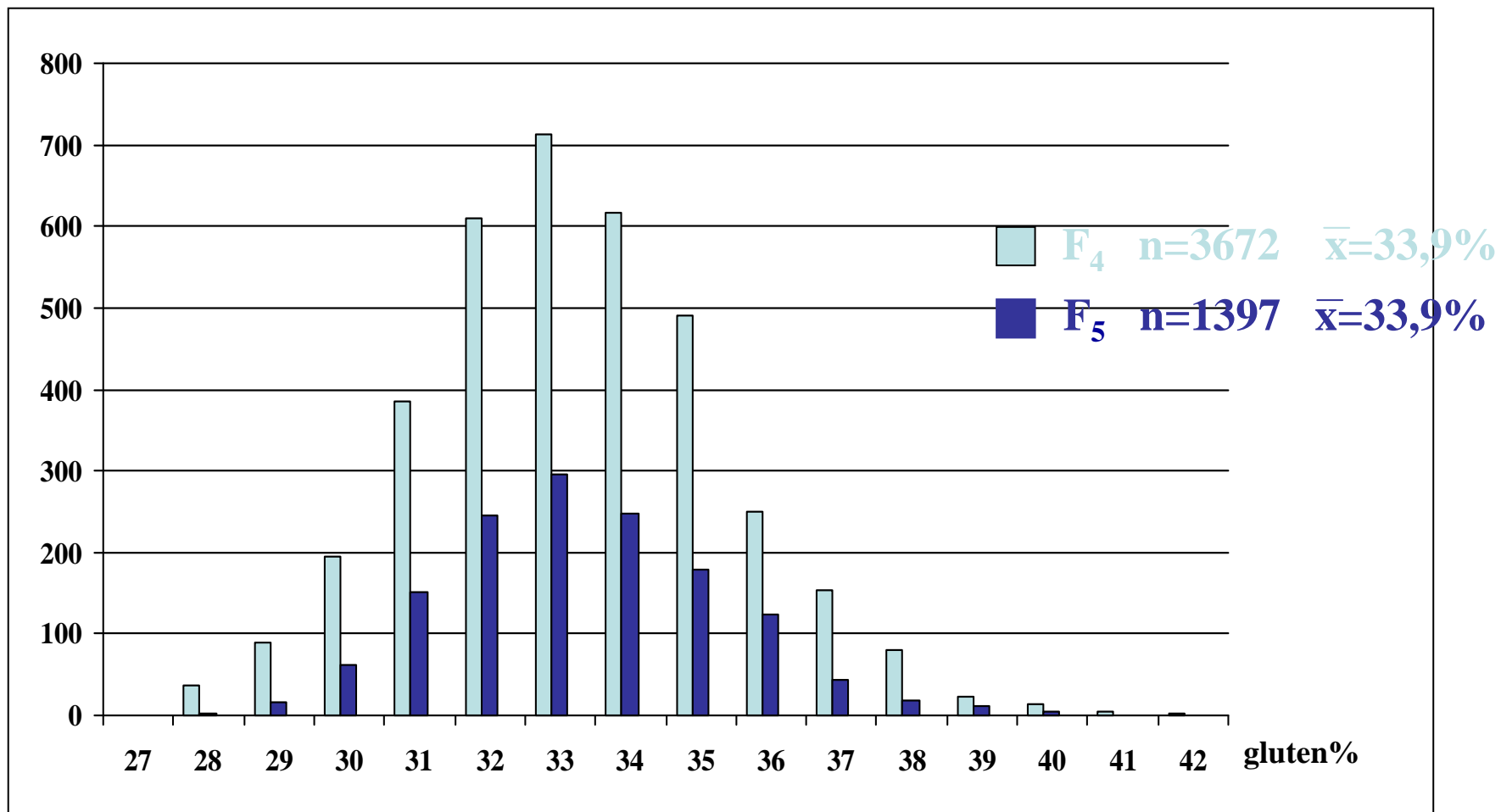
Gluten content distribution(NIT)

Martonvásár, 2004-2006



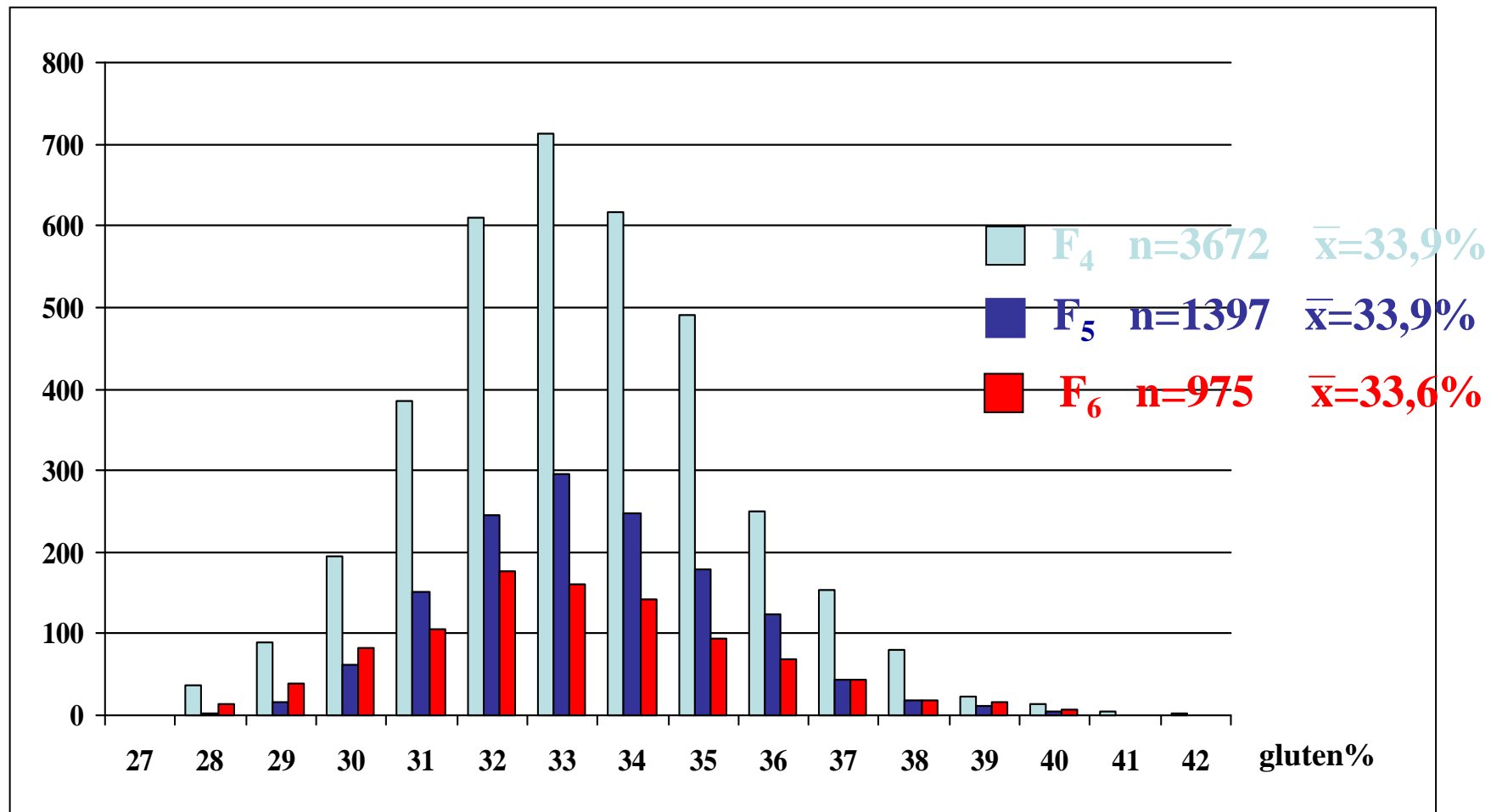
Gluten content distribution(NIT)

Martonvásár, 2004-2006



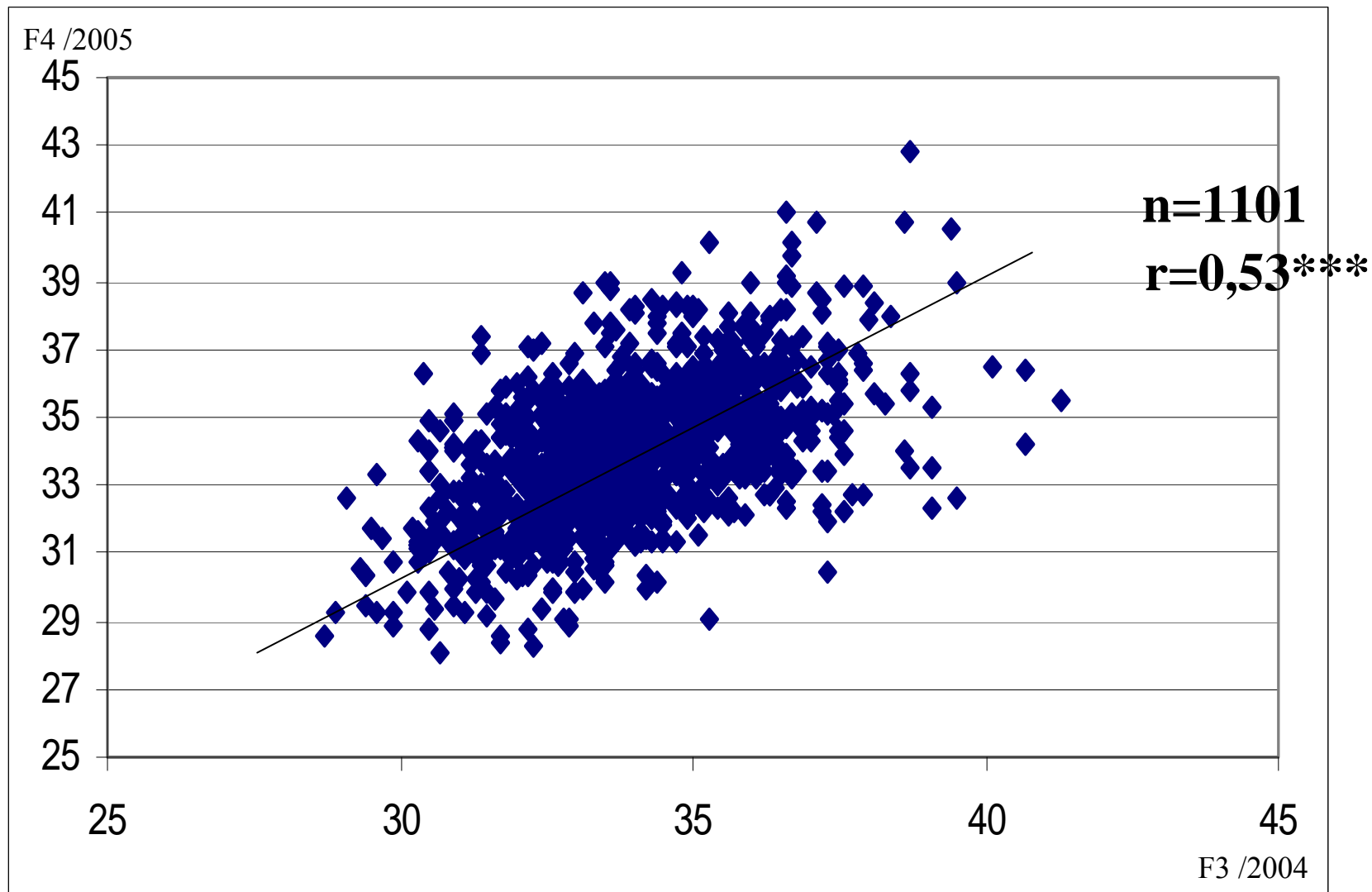
Gluten content distribution (NIT)

Martonvásár, 2004-2006



Wet gluten content of wheat lines in two consecutive years (NIT)

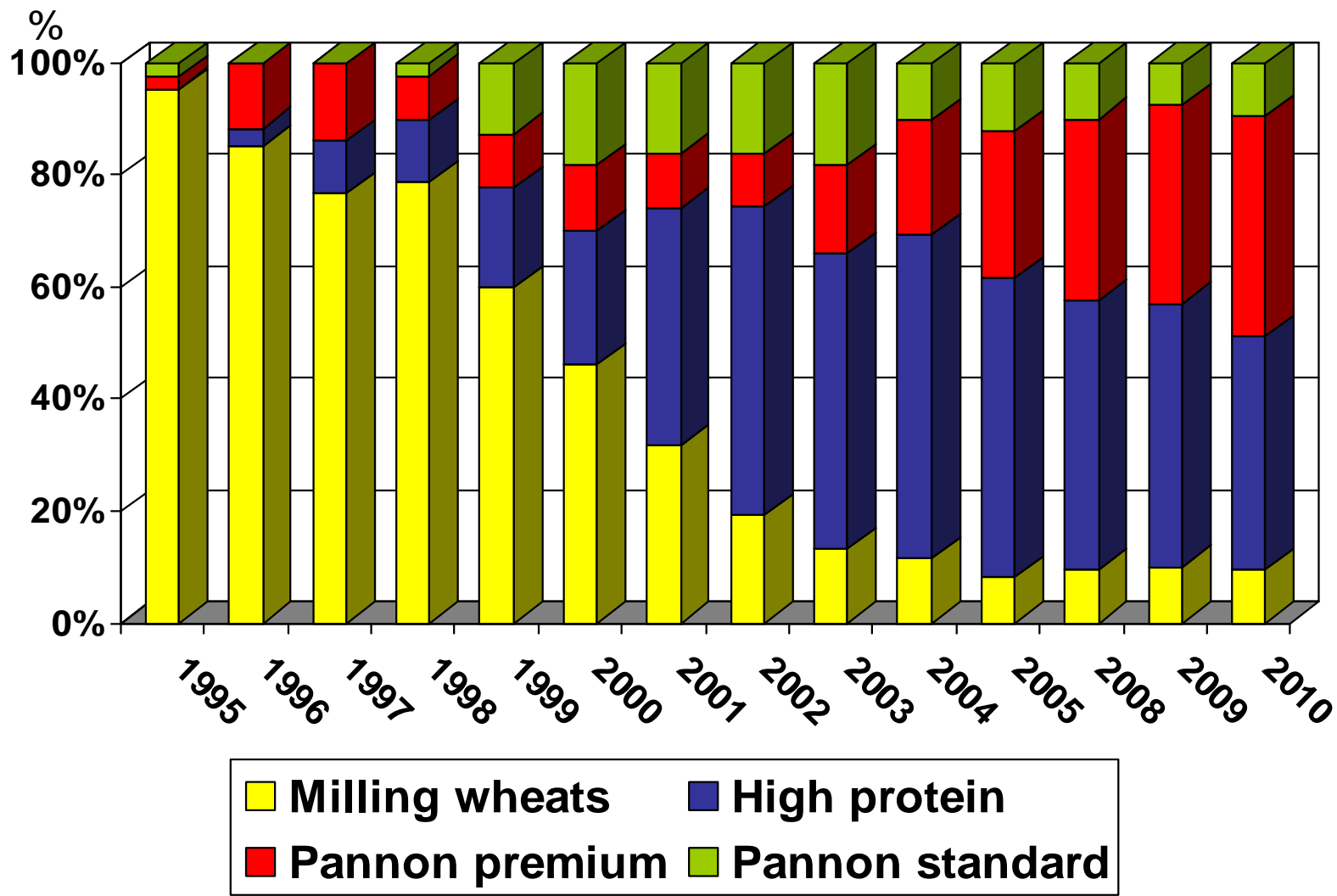
Martonvásár, 2004-2005



Martonvásári wheat varieties in the production 2010

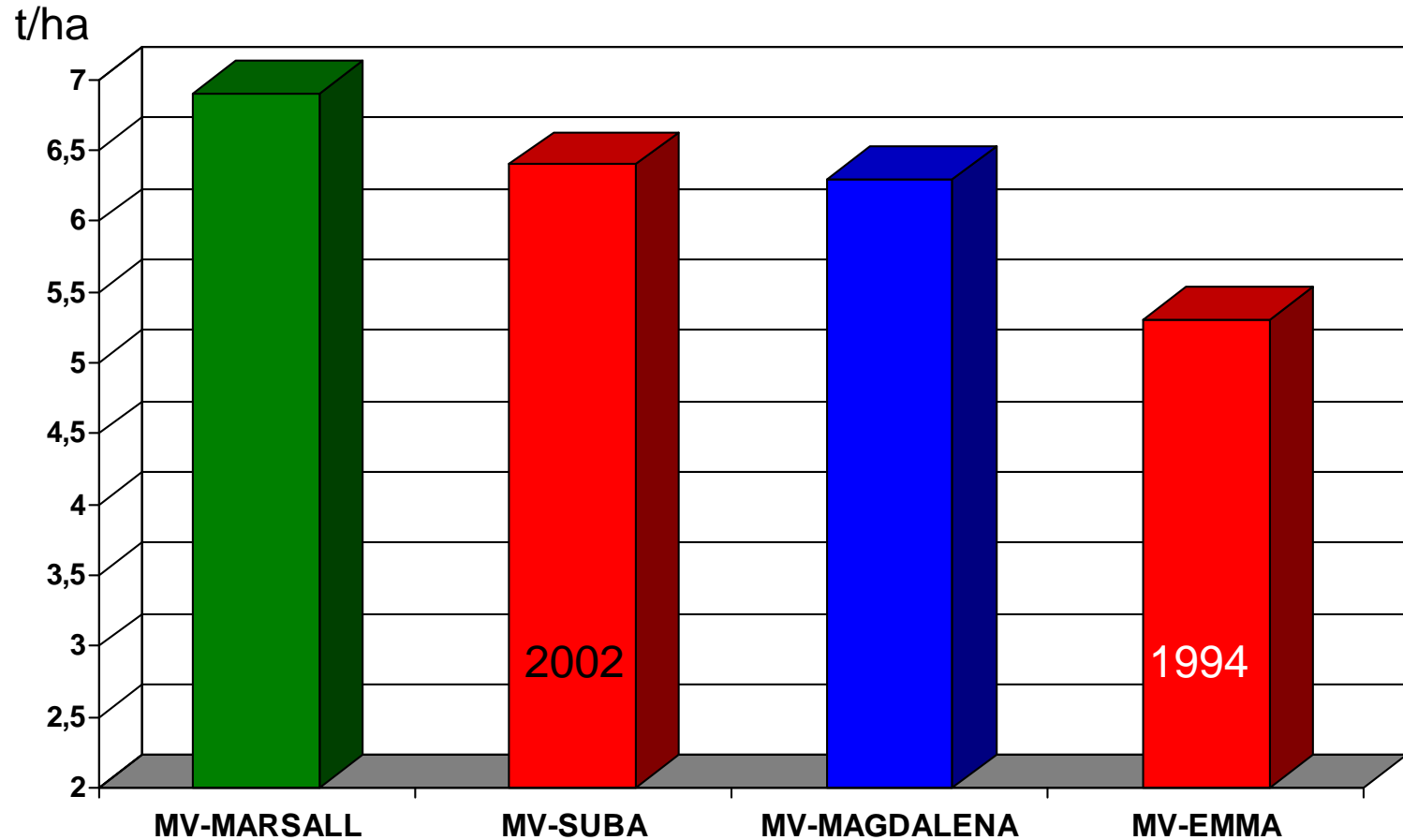
Pannon Prémium	Pannon Standard	High protein varieties	High yielding bread wheats	Soft wheats
<p><i>Widely grown</i> Mv Palotás Mv Suba Mv Ködmön Mv Kolo <i>IP program</i> Mv Mazurka Mv Toldi <i>New</i> Mv Menüett</p>	<p><i>Widely grown</i> Mv Toborzó Mv Magvas <i>New</i> Mv Bodri Mv Lucilla Mv Karizma Mv Petrence <i>Coming</i> Mv Kikelet</p> <p><i>Still available</i> Mv Emese</p>	<p><i>Widely grown</i> Mv Béres Mv Süveges Mv Csárdás Mv Verbunkos Mv Magdaléna Mv Walzer <i>New</i> Mv Kolompos <i>Coming</i> Mv Apród <i>Still available</i> Mv Vekni</p>	<p><i>Widely grown</i> Mv Marsall <i>Coming</i> Mv Tallér</p>	<p><i>Still available</i> Mv Regiment Mv Hombár</p>

Distribution of Martonvásár wheat quality types in the production



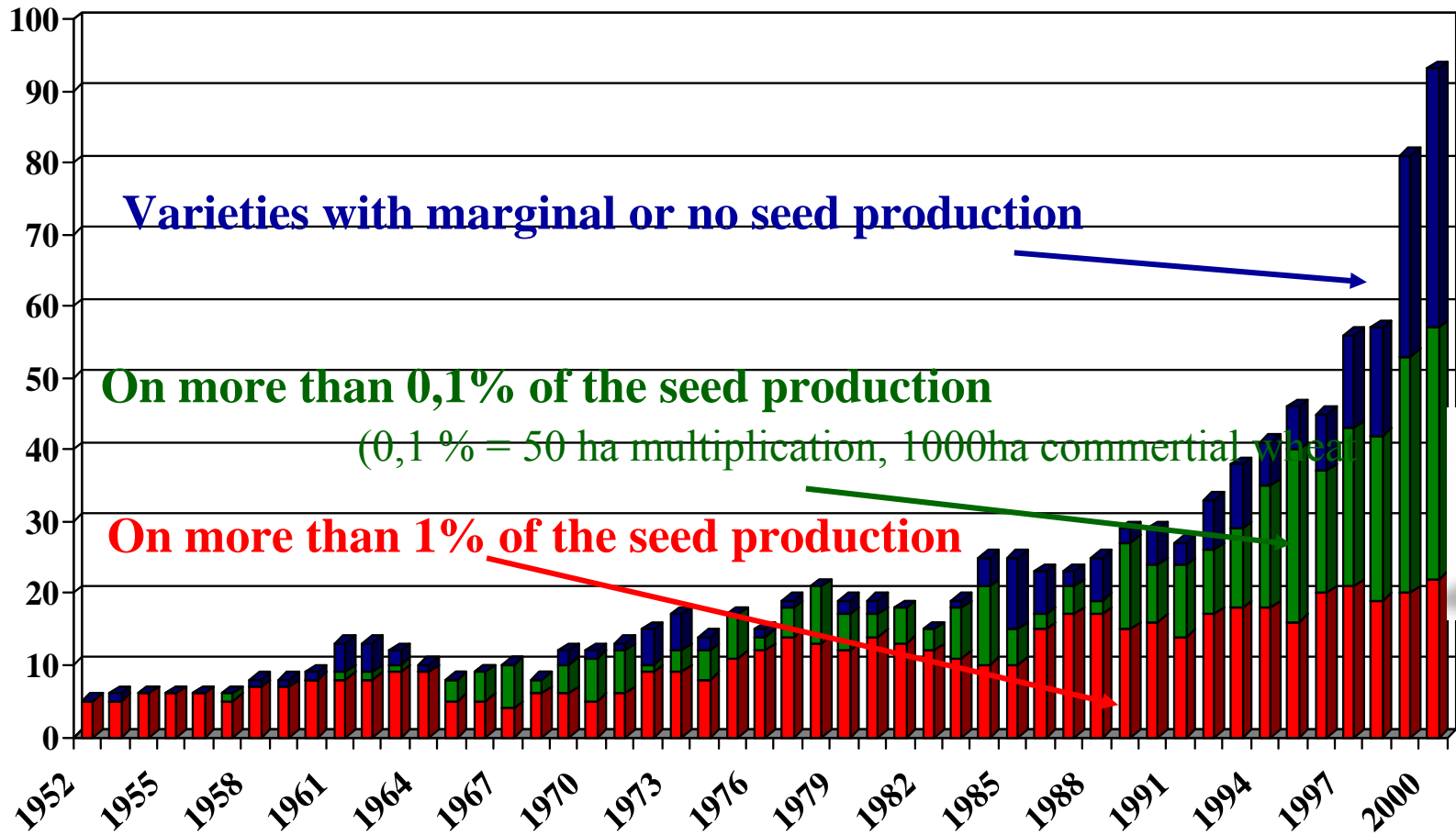
Yield potential of quality wheats increase

MTA MGKI, 2009



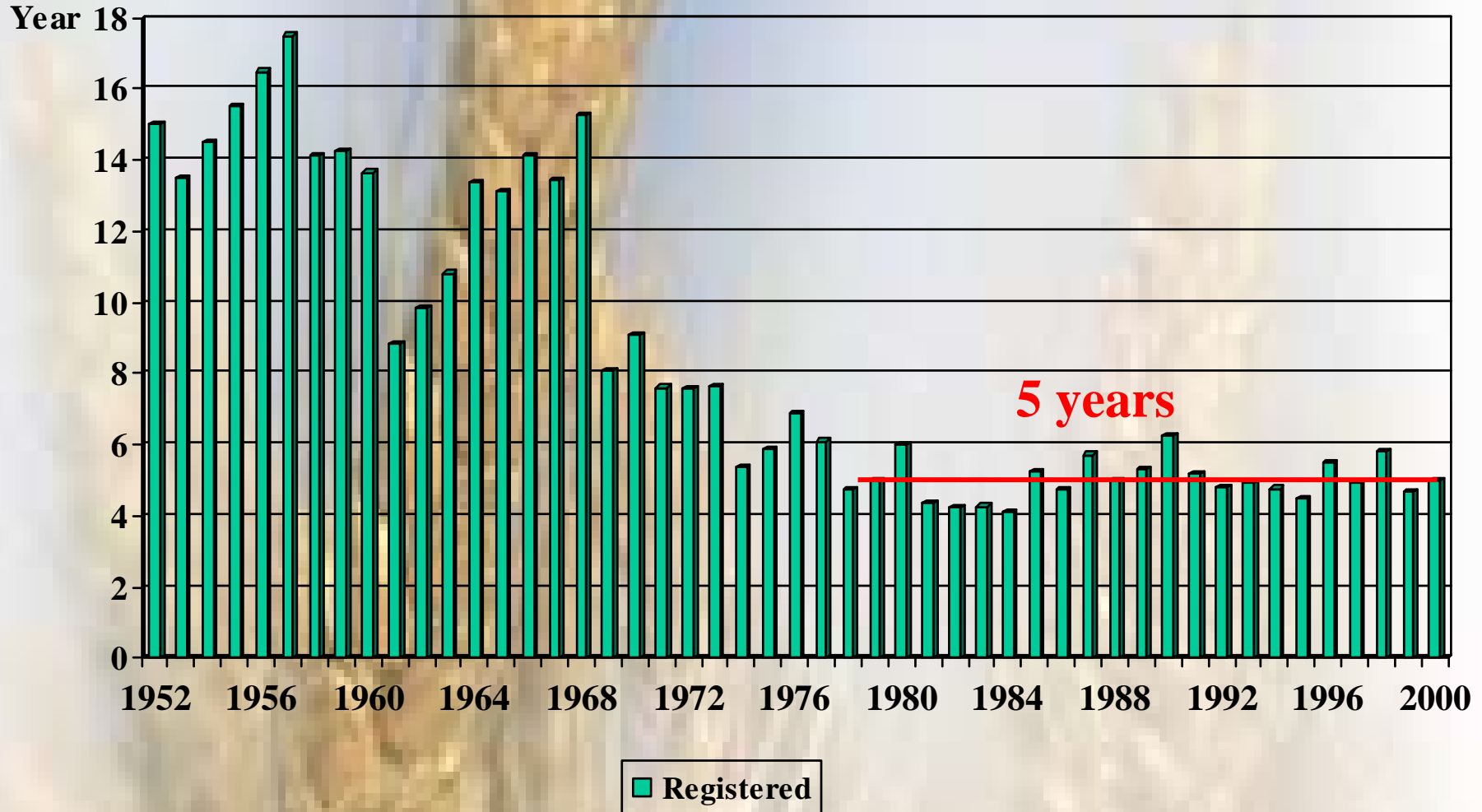
How many varieties are needed?

Registered winter wheat varieties in Hungary
1952-2000

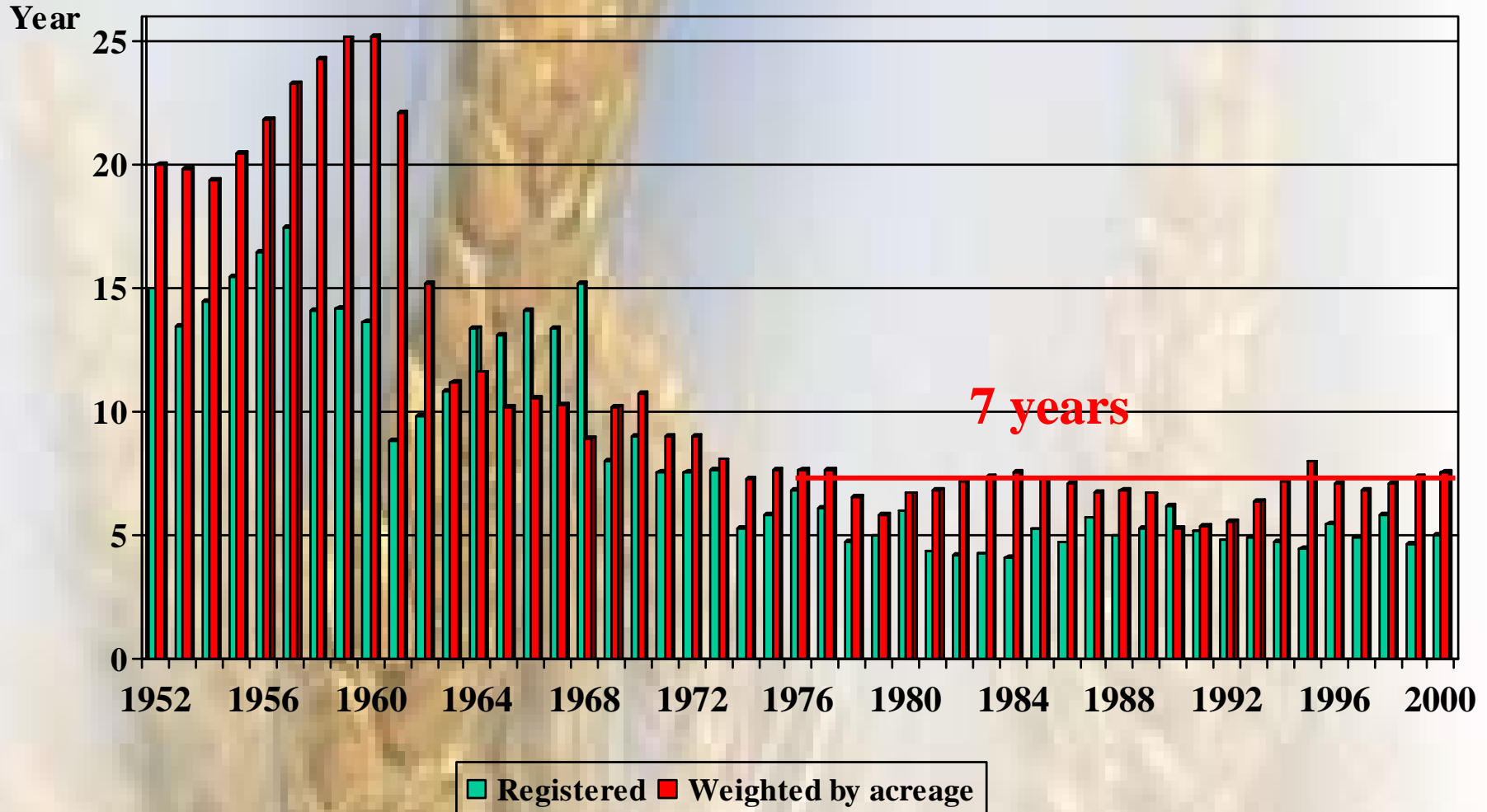


Age of registered wheat varieties in Hungary

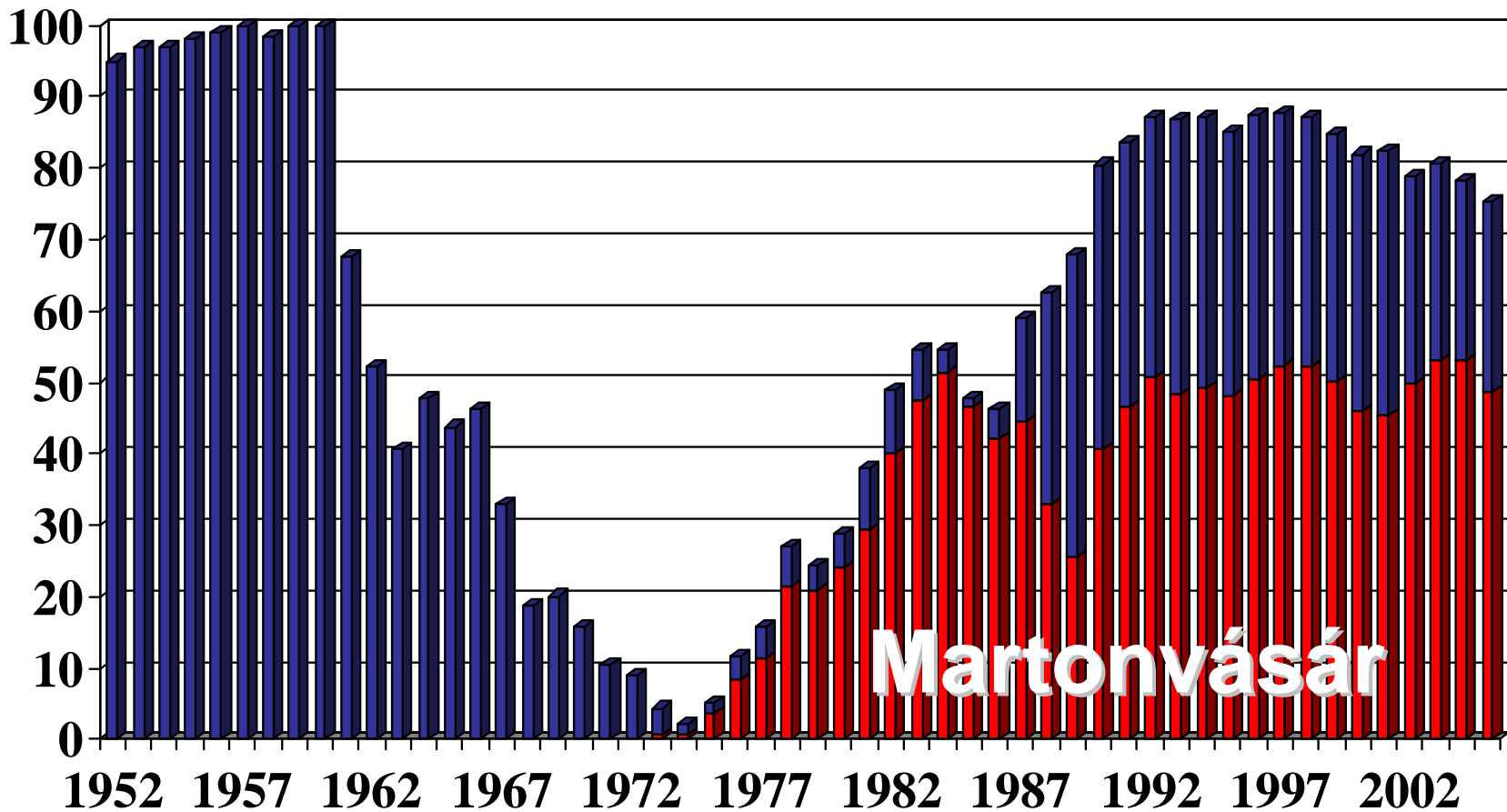
1952-2000



Age of registered wheat varieties in Hungary 1952-2000



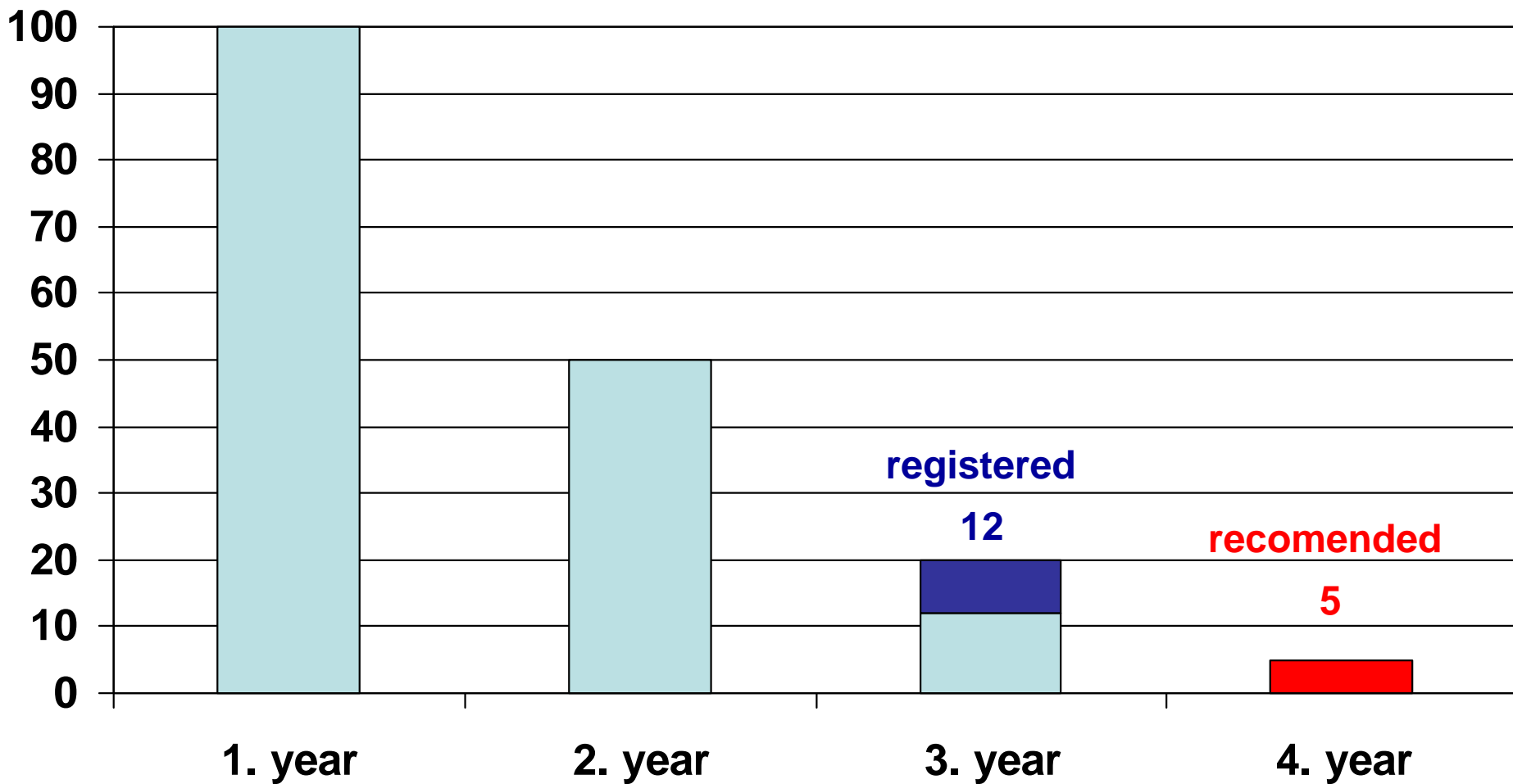
Market share of Hungarian bred varieties 1952-2005



Martonvásár

Chance of wheat line registration

(German example, 2007)





Thank you for your attention